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A

LECTURE

ON THE

ANATOMY, PHYSIOLOGY, & PATHOLOGY

OF

THE EYE;

WHICH WAS DELIVERED TO THE MEMBERS OF THE CITY OF LONDON
MEDICAL AND CHIRURGICAL SOCIETY.

BY THOMAS FIRTH,

SURGEON,

48, CLIFTON STREET, FINSBURY SQUARE.

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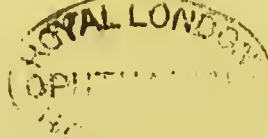
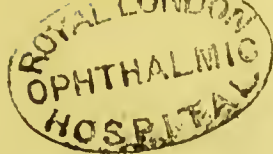
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THIS LECTURE

ON THE

ANATOMY, PHYSIOLOGY, AND PATHOLOGY
OF THE EYE,

WAS DELIVERED ON WEDNESDAY, THE 26TH OF JANUARY, 1831,

BY THOMAS FIRTH;

AND IS MOST RESPECTFULLY DEDICATED TO THE
MEMBERS OF THE

CITY OF LONDON MEDICAL AND CHIRURGICAL
SOCIETY,

TO WHOM IT WAS DELIVERED, AND AT WHOSE REQUEST IT WAS
ORDERED TO BE PRINTED.

48, CLIFTON STREET, FINSBURY SQUARE,
JANUARY, 1831.

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A LECTURE

ON THE

ANATOMY, PHYSIOLOGY, AND PATHOLOGY OF THE EYE.

MR. PRESIDENT,

To be surrounded by Gentlemen like those whom I am about to address, inspires me with confidence, that the City of London Medical and Chirurgical Society will very soon enrol amongst its members some of the first medical men that this or any country ever produced, and be, I trust, a lasting benefit to the public generally. As there are some here this evening who have not been present at my former Lectures, I beg to state for their information the object of this Society.

You are aware, Sir, that to begin to practise Medicine and Surgery is one thing, and that a comprehensive knowledge of them is another: all persons have not the same opportunity of becoming acquainted with their profession, neither have they the same fertile genius to discover, or suggest means, best calculated to prolong the life of man.

Gentlemen, the object of this society is to increase those opportunities, and thereby raise a field of reflective objects, by which the human suffering may be mitigated. Every well-educated medical practitioner is aware that anatomy, human and comparative, is the basis of a sound medical education, I therefore take this opportunity to recommend the present and rising professional public, to let no opportunity pass, by which a correct knowledge of this branch of science may be obtained.

It is difficult, tedious, and exceedingly repugnant to the feelings of many, to pore over the lifeless body for days, weeks, and many years, in order to obtain this knowledge ; but I may venture to say, that there are few in our profession who do not experimentally feel the importance of the following quotation, viz. “The proper study of mankind is man.”

It is my intention this evening to present to your notice one of the most important organs belonging to man, *i. e.* the eye ; and I shall likewise mention some of the diseases to which it is liable. The eye is surrounded by seven pieces of osseous substance, forming, when united, the orbit or socket which serves as its defence, and also for the attachment of various muscles that are connected with the eye.

That the non-professional part of this assembly may understand what I mean by muscle, I beg to refer them to my Introductory Lecture, and at the twenty-fourth page, it is stated that “Muscle is a compound of small fibres connected together by cellular substance, and interspersed with blood vessels, absorbents, and nerves.” I also beg leave to observe that muscles are of various sizes, some being of considerable magnitude, and others very small ; those muscles which are appendages to the eye are of the latter description, as will be seen when I show them.

In describing the eye, anatomists usually consider, first, its appendages, called external parts ; and afterwards those forming the globe, called internal parts. Of the external parts, I must first notice the *supercilia* or eyebrow, which is the line of hair forming an arch over the eye.

I have no doubt that some of the non-professional part of this assembly will, while I am now describing this part, ask themselves its various uses ; some may suppose it a mark of beauty only, others may think to the contrary ; but

anatomists say its use is to assist in shading the eye from too strong a light, and also to defend it from the sensible transpiration or sweat which flows down from the forehead.

The eyelids are formed externally of common integuments, under which are situated two muscles, the one called *orbicularis palpebrarum*; and the other *levator palpebræ*. The first of these muscles surround the eyelids, and when brought into action it closes the eyelids. The second of these muscles arise deep within the orbit, near the opening by which the optic nerve is transmitted to the eye, and on which I now rest the probe, by a small flat tendon, which afterwards becomes fleshy and terminates, first in the eyelid, by a considerable expansion of muscular fibre, and lastly by tendon. The use of this muscle is to raise the upper eyelid. The action of the eyelids is exceedingly quick, particularly the upper one, and on their exterior edge we observe a row of hair called *celia*, or eyelashes. In the diagram, plate I., fig. 1, and 2, I have endeavoured to represent the eyelids which are divided into first, superior, and secondly, inferior; also into outer canthus, plate I., fig. 3, and inner canthus, fig. 4. On the inner canthus, fig. 5, there is a discernible small red tubercle, which all of you may perceive in your own or in another person's eye, if you examine it: this small red tubercle is called *caruncula-lachrymalis*, and from it we may observe a number of small hairs arise. This small glandular body secretes a peculiar substance called smegma, which is said to be exceedingly offensive to insects. On the very extremity of the internal canthus interiorly, diagram plate I., fig. 6, there is a small opening called *punctum lachrymalis*, from this opening interiorly a small canal is formed, which meeting with the one from the other eye, forms the *lachrymal sac*, a continuation of which is

called the *ductus ad nasum*, which duct conveys the secretions of the eye into the nose. In the diagram, plate I., fig. 7, you may perceive a number of small dots, situated on the immediate edge of the eyelids; these dots are to represent the meibomian glands, which, in the living subject, are situated immediately under the skin, and they secrete a sebacious matter that softens the extreme edges of the eyelids, and prevents them from adhering together during sleep. The meibomian glands are liable to become affected in common inflammation of the eye, also in scrofulose inflammation, and in *psorophthalmia*, and also in the disease called *ectropium*, or turning out of the eyelids with redness. Ectropium being a disease not only unsightly in its appearance, but also a very obstinate affection, requires our most serious consideration, as when it arises from scrofula, or hereditary pre-disposition, it not unfrequently baffles very excellent surgeons. Out of a many cases of this kind, at present under my care, I will relate one of seven years standing, which has began to yield under mild alterative treatment. This case made its appearance when the patient was commencing the third year of her age, immediately after having had the measles. The eyelids were so much turned out, that the patient became frightful to look at: the *puncta lachrymalia* were obstructed or turned from their proper direction, so that the increased vitiated secretions of the eye were forced over the cheeks, and by it the skin upon the cheeks was in one continued state of excoriation. In conclusion, I beg to inform you that this case is very nearly well, the skin being entirely healed, the secretions of the eye much diminished, the eyelids appearing natural, with the exception of a slight redness upon their upper surface.

In returning to the descriptive part of my lecture, I beg leave to request your attention to the diagram, plate I.,

fig. 8, and upon the immediate edge of the eyelid you will observe a line extending from the outer to the inner canthus of the eye : this part is of a cartilaginous structure, and on the whole of its exterior surface there is a groove which serves to convey the tears into the *punctum lachrymalis*.

The eyelids serve to cover the eye during sleep, as you are all aware of, as well as to defend it from various substances accidentally, or otherwise directed upon it ; also to lubricate the outer *tunic* by moving the lachrymal secretions over its surface.

While stating that the eyelids serve to defend the eye from various substances accidentally or otherwise directed upon it, I am reminded of a circumstance which occurred on the 5th day of December, 1830, to a gentleman who I was called to attend, and which circumstance would have destroyed the eyes had not they been protected by those appendages. As I proceed with the circumstance it will become, I have no doubt, familiar to you, in consequence of its being attended with a premeditated ferocity, hardly equalled in the annals of history, and from its having been reported in all the daily and weekly newspapers of the day. This case is that of Mr. and Mrs. W., who had nitric acid thrown in their face as they were proceeding to, or returning from Mr. Powell's chapel at Peckham, by a person professing to be a deist. I have been creditably informed that this person followed those worthy people nearly every Sunday for three months with a loaded pistol, and would have shot them had he not considered that death by a pistol-ball was too easy a death for them to die : the other expedient was therefore resorted to, he having considered that to deprive them of their eye-sight was a far greater punishment. This accident occurred on the Sunday, about one o'clock, and on the following morning I was sent for to

attend Mr. W., Mrs. W. having escaped uninjured, except her clothes, which were entirely destroyed. When I arrived, I found Mr. W's face in one continued state of inflammation, the *tunica conjunctiva*, or in other language the white of the eye, resembling a mass of coagulated blood. The eyelids were much injured, and also the whole face, and on the internal canthus of the left eye about half an inch in circumference the integuments and muscular portions were wholly destroyed, leaving when they were sloughed off, the superior nasal process of the superior maxillary bone, and the nasal process of the frontal bone quite exposed. The design of this infatuated man was entirely frustrated in the complete recovery of my patient; and to add to the patient's satisfaction, there remains no defect in his sight, or any marks on the skin, except a slight contraction of the integuments of the internal canthus of the left eye.

Various are the diseases to which the eyelids are liable, thirteen of which I beg leave in this place to enumerate. The first of these affections, and the most simple of the whole, is *Blepharophthalmitis*, or common inflammation.

The 2d is *Anchylops Erysipelatosa*, or erysipelatous inflammation of the internal canthus.

The 3rd is *Psorophthalmia*, or a disease propagated by the itch.

The 4th is *Hordeolum*, or styte.

The 5th is *Sarcoma Palpebrarum*, or a granular affection of the tunica conjunctiva, or white covering of the eye.

The 6th, *Distichiasis*, or double row of eyelashes.

The 7th, *Trichiasis*, or inversion of the eyelids.

The 8th, *Ectropium*, or eversion of the eyelids.

The 9th, *Blepharoptosis*, a morbid elongation of the eyelids.

10th, *Blepharoplegia*, or palsy of the eyelids.

This affection arises either from injury done to the parts

by blows, or it may arise from various emollient applications having been applied to the part; it is sometimes a consequence of water in the brain: worms in the stomach, or in the alimentary canal, may sometimes be the cause of this disease. The reason that I have particularly noticed this disease, is because I have two cases of this kind at present under my care, the one a person of twenty-five years of age, and the other an infant about twelve months old. The latter of these cases was overlooked by the parents for some time, nor were they impressed with its being a disease until after their friends had made continued and frequent observations respecting it. On my first visiting this patient, the left eyelid appeared nearly closed and immoveable by its own powers, and the pupil of the eye was turned towards the external canthus: the child appeared dull and heavy, resting its head upon the nurse's shoulder, or upon any thing that was near it. From the improvement already made in this case, I trust I shall be enabled in a future lecture to present the little patient to you perfectly cured, and at the same time acquaint you with the plan of treatment. Having commented thus far upon the tenth disease, which affects the eyelids, I must proceed to enumerate the remaining three that I have previously promised, the first of which being in order the

11th, is called *Blepharospasmus*, or cramp of the eyelids.

12th, *Anchyloblepharon symblepharon*, or concretions of the eyelids.

13th, *Tumores Cystici*, or encysted tumours of the eyelids.

In presenting this skull to your notice, I have to observe a small depression, and in which I will place the point of my probe. This serves for the situation of the *lachrymal gland*, (see diagram, plate I., fig. 9.) to which I beg leave to draw your immediate attention. Before I enter upon

the description of this gland, I beg to remind you, that glands are divided into three varieties, a particular description of which may be seen in the twenty-ninth page of my introductory lecture. The lachrymal gland is of the glomerate kind, and from it proceeds six or eight small passages called excretory ducts, (see diagram, plate I., fig. 10.) and through them its peculiar secretion is conveyed to the eye. The secretion of the *lachrymal gland* is sensibly increased in the act of crying, and gives out those large drops of water which you observe trickle down the face.

In the diagram, plate II., fig. 1, I have endeavoured to represent the white covering of the eye called *tunica conjunctiva*; it is very transparent, as can be seen by the dissection before you; it is also very highly vascular, and, from dissection, appears to be an expansion of the tendinous portion of the recti muscles. This membrane not only covers the eye, but is reflected over the internal surface of the eyelids, to which it is more loosely connected than to the eyeball. In separating this covering from the others of the eyeball we find it very easy to accomplish, except from the transparent cornea of the sclerotic coat, from which it cannot be separated. Vide diagram, plate II., fig. 2. This covering of the eye is liable to four varieties of inflammation, the first of which, and the most simple, arises from common cold, and is called *Ophthalmia Catarrhalis*.

The second arises from scrofula, and is called *Ophthalmia scrofulosa*.

The third kind of inflammation is called *Blepharophthalmo-blennorrhœa*, or purulent inflammation.

The fourth and last is *Ophthalmia Gonorrhœica*, or inflammation arising from gonorrhea.

Scrofulose inflammation of the eye, and all diseases arising from scrofula, have for many years attracted my particular attention, and I feel pleasure in stating, from ex-

perience, that few cases that I have hitherto met with, have resisted the remedies which I have employed. By way of illustration, I will relate several cases of *strumous ophthalmia* that have come under my care; and being of unusual severity, they may perhaps be interesting.

The first is the case of a young lady, now about seventeen years of age, who, while at boarding-school, became the victim of this disease. On its commencement, the eyelids were much swollen, and the *tunica conjunctiva*, or in other words the white of the eye, was exceedingly red, or what is commonly called blood-shot. There was an incapacity to open the eyelids; light or heat would bring on considerable uneasiness, and sometimes pain in the eye; and there was an ichorous discharge constantly flowing from the eyes. When the mother of this young lady first consulted me, she stated that her daughter had been in the above state for three-years-and-a-half, always requiring the care of a person to attend her; she likewise stated, that her daughter had been thoroughly salivated six times, and had constantly taken medicines for the whole of that period, still the disease was not the least controlled by these measures, and her mental faculties had so far digressed, that she appeared idiotic. In looking over my case book, I find this patient was perfectly cured in six months after she was placed under my care; and at present she is a very fine young lady, her vision, mental faculties, and health being perfectly restored.

The next is the case of a young lady, now in her fourteenth year, who became the subject of *strumous ophthalmia* after having been vaccinated. Her parents had consulted various eminent surgeons during the whole period of seven years, and had visited many bathing places at their request; still the disease was not lessened in its severity, but as time advanced it became more aggravated. A friend of

mine, whose niece I was then attending in a similar case, recommended me to the parents, and, in consequence, I was sent for. When I arrived, I found this young lady seated in a dark room, and two or three handkerchiefs over her eyes, in order to obstruct the light and heat from the fire, which usually gave her pain. She was pale, emaciated, had scarcely any appetite, and that which she did eat was administered by an attendant. The bowels were constipated, the eyelids much swollen, the transparent cornea studded with small vesicles, and the aqueous humour turbid. This was one of the most difficult cases I have ever met with, resisting in a great measure all the remedies that were resorted to for five months, at which period the disorder yielded to the plan of treatment that I had previously suggested; and at the present period my patient is perfectly restored.

The third case which I shall notice, is a boy, about seven years of age, whose mother had hereditary scrofula, or in other words, king's evil. This little fellow had had strumous ophthalmia from his birth, and the *cornea transparens* of the right eye had become opaque from continued inflammation. As a symptom characteristic of this disease, the eyelids were much swollen, and the meibomian glands much affected, inasmuch that the eyelids were, if left without applications, constantly agglutinated: the right eyeball was much larger than the left, and the eyelids had become elongated. His appetite had suffered considerably, his general health was very bad, nor could they allow him to be the least exposed to the air without his having an increased accession of the inflammation. When he was placed under my care, his father informed me that he had spared no expense or trouble in endeavouring to get his son cured, and all plans hitherto had failed, and he was in consequence fearful that his son would always be the same;

however, he was placed under my care, and in about nine months afterwards I pronounced him cured, and up to this time he has had no relapse.

The fourth case, is a gentleman, aged forty-five, who stated that he had been much troubled with swellings in the neck during his youth, but after having made several sea voyages, they disappeared. When he applied to me the tunica conjunctiva was in one continued state of inflammation: he had great pain in his head, and his vision was so much impaired that he could not distinguish one thing from another. Both eyes were considerably larger than they had been previous to this affection; and on close examination, the iris appeared surcharged with blood, and the transparent cornea of a dull jelly-like appearance. He stated that this affection had been coming on for more than two years, and he had become fearful that his sight would leave him altogether. He had constant nausea of the stomach, appetite very bad, and bowels constipated. In about seven months this patient was perfectly cured.

Case 5. Mr. —, aged sixty, stated that he had been affected with a disease in the right eye for more than twelve years, and that about twelve months before he consulted me, the other eye had also become affected. He had been constantly taking medicine, and making use of various applications, some of which relieved him, while he persevered in their use, and others not at all: he could sometimes distinguish colours, but not distinctly. His appetite was exceedingly good, and his bowels regular: his nights were passed in sound sleep, excepting when he had taken a little cold, at which time the inflammation was much increased, attended with considerable dull heavy pain in the ball of the eye. The pupils of the eye were constantly much contracted, and the iris presented a

dark brown appearance. In three months this patient was perfectly cured.

Case 6. Miss —, aged eighteen years, of spare habit, and florid countenance, thick lips, broad and extended nostrils. She stated that her eyes had been inflamed, and painful at various periods for more than four years. Every morning when she awoke the eyelids were so firmly agglutinated that they required the use of warm water for some length of time before they could be separated: her appetite had been always very good, and her bowels regular. The disease made its appearance while she was at boarding school, had been constantly attended ever since by very highly respectable surgeons, and for the last six months had been under the care of the surgeons of an infirmary for diseases of the eye. Her right eye was much worse than the left, with which she could scarcely distinguish anything. On examining the eyes they appeared slimy, and from them there was a constant discharge of water, that gave her as much pain as if boiling water had been poured upon them: the transparent cornea was studded with blisters or small vesicles, the pupil was very small and contracted, and the eye was considerably affected by either light or heat; also the skin of the upper and lower lips was rough and cracked, forming a number of lines which appeared to emanate from the cuticle covering the interior of the lips. This patient is so far convalescent, that I may venture to calculate upon a perfect cure.

Case 7. Mr. —, aged twenty-nine years, in 1814 had leprosy, which continued visibly to affect him for more than ten years. During the whole of this period, his eyes were unaffected with any disease; but soon afterwards, while on the sea coast, a slight inflammation made its appearance. In about four months from the commence-

ment of this inflammation (apparently convalescent), he had the misfortune to be wet through in a thunder-storm, and, in consequence, the inflammation returned with redoubled violence; and his upper and lower extremities became so much contracted, with general weakness of the whole system, that he was unable either to walk or stand. There was a continued fever attendant on this affection, and the right eye appeared one continued mass of blood, with entire loss of vision. The appetite was feeble, being unable to digest any kind of animal food; the bowels were constipated; and the skin constantly hot and dry. When I first saw this patient, I had little hope of success; and, in consequence, I informed his friends that if they thought proper they might make a trial for three months, and at which time, if there was no amendment, they could discontinue; but if any amendment, however slight, was experienced, it would be quite sufficient to excite confidence in a further trial. This patient was perfectly cured in thirteen months. Perhaps I have been a little verbose in the recital of so many cases of one kind, but if that has been the case, I trust I shall be excused, having done so with a view to rouse your exertions in the cure of diseases, however slight your hope may be, and I would have you not slightly pass over cases because others have pronounced them incurable.

As well as the four kinds of inflammation above enumerated, the tunica conjunctiva is liable to a disease called *Pterejium* or winged film, and also *Lipoma conjunctiva*, meaning small tumours and excrescences. The posterior part of the eyeball is entirely surrounded by muscles, and by them this organ performs all the various motions to which it is liable.

The muscles of the eyeball are six in number, five of which arise from the edge of the optic foramen, situated at the posterior surface of the orbit, and on which I have now

placed the point of my probe : the other arises from the superior nasal process of the superior maxillary bone or upper jaw, and all of which are inserted into the sclerotic coat. The four muscles which I now present to your notice, are called recti muscles ; the first is denominated rectus superior, and raises the eye upwards : the second, and that which I have my finger upon, is called rectus inferior ; this muscle directs the eye downwards. The rectus externus directs the eye outwards, towards the temples ; and the rectus internus directs the eye inwards, towards the nose.

The two oblique muscles come next to be noticed, the superior of which arises from the edge of the optic foramen by a slender tendon, as you perceive by the dissection before you ;—a short distance from its origin, and at that part where it passes the eyeball, it becomes fleshy, and afterwards forms a smooth tendon, which passes through a cartilaginous pulley, situated in the upper and inner edge of the orbit : it is then directed downwards to be inserted into the eyeball.

The other of the oblique muscles is called obliquus inferior, and acts in direct opposition to the obliquus superior.—This muscle arises from the superior nasal process of the superior maxillary bone, passes indirectly backwards and outwards under the eye, and is inserted into the sclerotic coat opposite the former muscle.

Having described all those parts called external parts of the eye, I must now direct your attention to those parts denominated internal, and first the sclerotic coat.—This covering presents, on examination, a hard horny appearance, and is divided into two portions—the one called Cornea Opake, represented by the diagram, plate II., fig. 4, and on which I will place the point of my probe, also by part of the actual covering, which I beg leave to send round for inspection ; the other portion of this covering, is called Cor-

nea Lucida, in consequence of its being transparent, and it also is represented in the diagram, plate II., fig. 3. The posterior surface of the cornea opaque is perforated by the optic nerve, which you observe projecting from it, and is also represented in the diagram before you, plate II., fig. 5. The sclerotic coat is liable to suffer from rheumatic inflammation, and if it is not treated very actively, will terminate, in many constitutions, in entire loss of vision. About twelve months ago, I was requested to visit a lady one hundred and fifty miles from London, whose sight had been entirely destroyed by this kind of inflammation. She informed me that three years before the time of my seeing her, a slight inflammation in both eyes made its appearance, which afterwards became so severe, that it resisted all the remedies that were made use of, and that she had been two years in total darkness. On examining the eye, it was evident that no remedy, however judiciously administered, could be of any service, the whole structure of the eye being entirely disorganised.

Another protracted case of this kind has very recently come under my care; and if the representation of the gentleman be correct, his medical attendants had altogether mistook the nature of the case. I beg leave, however, to observe, that you must not always give ear to the railings which are directed against medical men; for such is the opinion of some, that no one can be skilful without he can cure incurable diseases. But to proceed in the description of this case, I beg leave to observe, that on examining the eye a green appearance presented itself in the centre of the pupil, with loss of action of the iris. The contractile power of the iris had been destroyed by the application of belladonna, as stated by the patient, and the vision was nearly extinct. There was *evident* deposition of lymph into the aqueous humour, notwithstanding from the benefit already

derived, I have every reason to hope, that by a perseverance in the plans suggested, for some time, a considerable improvement will be experienced. Under the sclerotic covering the choroid coat is situated, see diagram, plate II., fig. 6 ; it is exceedingly full of blood vessels, and by them it is connected to the above sclerotic covering. This coat or covering of the eye is not only vascular, but it is also a very soft and delicate membrane: it lies interiorly to the sclerotic coat, to which it adheres until it arrives at the transparent cornea, and there we find that it passes downwards and inwards to form the coloured part of the iris. Vide diagram, plate II., fig. 7. In the dissection before me, the iris presents itself, and in its centre there is an opening called the pupil, see diagram, plate II., fig. 8. It will be necessary here to observe, that the iris is divided into surfaces, the anterior, or that which is situated most outward is called iris, see diagram, plate II., fig. 9, and the posterior or inner surface, is called uvea. This portion of the eye, the iris, is possessed of peculiar contractile properties, rendering it very susceptible to the action of light. The iris is liable to inflammation called iritis, which nosologists have divided into three varieties, viz. *iritis idiopathica*, *iritis syphilitica*, and *iritis arthritica*. Until diseases of the eye had become more generally understood and more universally considered, these various affections received the general appellation of inflammation of the eye. The treatment of these various kinds of inflammation require considerable skill and firm decision, otherwise they are exceedingly liable to terminate in complete loss of vision ; nor is considerable skill and promptness required in the use of various remedies, but also a thorough knowledge of each variety ; as each of which require a somewhat different plan of treatment. The iris is liable to be affected with the following diseases, viz. *mydriasis*, or a constant dilated state

of the pupil. *Myosis*, or nearly an obliteration of the pupil; *synechia anterior and posterior*, or an adhesion of the anterior surface to the transparent cornea, or the posterior surface to the capsule of the crystalline lens: also *prolapsus iris*, a state of disease requiring an artificial pupil. If you closely examine the dissection that is passing round the room, and which is also represented in the diagram, plate II., fig. 10, you will observe a circle surrounding the exterior surface of the choroid membrane at the very edge, where it adheres to the ambit of the transparent cornea; this white line is called the ciliary circle. If you more closely examine the dissection before you, you will find on the inner surface of the choroid membrane, corresponding in situation to the line on the exterior surface, a number of small grooves or *striæ*, plate II., fig. 11. They are called ciliary ligaments: these two parts of the eye are not unfrequently classed together under the name of *corpus ciliare*. The posterior surface of the choroid membrane is covered with a black substance called *pigmentum nigrum*, and this portion of the eye is most plainly observable in the dissection that is passing round the room, and it is also represented in the diagram, plate II., fig. 12.

For the sake of elucidation, I will digress a little from the immediate consideration of the internal parts of the eye, and briefly describe the origin of the optic nerve, the expansion of which is called the retina, see diagram, plate II., fig. 13, to which I wish to draw your most serious attention. All medical gentlemen present (and I am happy to see so many very highly respectable) are aware, that the brain is divided into *cerebrum* and *cerebellum*, also that the *cerebrum* is divided into two hemispheres or halves, each giving off the same number of nerves destined for the same purpose. The optic is one of those nerves, and emanates from the *thalami nervorum opticorum*. A little

before they pass out of the cranium into the orbit they unite, and again separate, one passing through the right optic foramen, to proceed to the right eye; and the other, through the left optic foramen, to the left eye. I have introduced a small piece of paper into each of these openings, and I will send the skull round for your inspection. The expansion of these nerves, as I have before stated, is called the retina, from *rete* a net, and is the immediate organ of vision; this is the substance, and it surrounds this transparent body called the vitrious humour, of which I shall afterwards speak. This rete is of a pulpy consistence, and, to me, its colour is something resembling a French grey, but most anatomists describe it as being of a whitish colour.

The dissection which I now request you to notice, clearly demonstrates the origin of the retina, commencing as you can observe from the optic nerve, immediately after it has penetrated the various coverings of the eye, see diagram, plate II., fig. 14. It is then expanded over the whole of the vitrious humour, vide diagram, plate II., fig. 15, and terminates in the ciliary processes, plate II., fig. 11, which have been previously described.

The retina is subject to a disease denominated by the Greeks *amauroris*, and by the Latins *gutta serena*, and it is one of the most lamentable affections that can afflict mankind. In some persons, this disease comes on very suddenly, and in other persons very gradually; but in whatever way it commences, it is one of the most difficult diseases that art or science have to contend with. That many cases of this kind are curable, if not too long neglected, under peculiar attention and management, I do not hesitate to affirm from experience, notwithstanding there are cases that will from the first baffle all our art; such, for instance, are those cases when the retina and pigmentum

nigram have been absorbed, or when particular tumours within the cranium, press upon the optic nerve. Amaurosis, from scrofula or worms in the intestinal canal, and from many other causes, will very often admit of cure under proper management and care. Two or three successful cases of amaurosis, I will relate; and first, that of a young lady, eighteen years of age, whose parents reside a considerable distance from London, but who have friends residing in the city of London. The letter which I received from the parents, relative to an opinion as to the probability of a cure, went on to say, that their daughter, five years before, had fallen down, dislocated her elbow, and bruised her head, but so very slight that they thought it of no consequence: some time after, they perceived that she could not see things so well as formerly, and in a few months she became quite blind.—At this period her appetite was voracious, and she had become exceedingly corpulent. She then lost the use of her lower extremities, and afterwards, her stomach became so weak that she could take no solid food. She was altogether confined to her bed, and bottles of boiling water kept constantly to her feet, and she was also covered by eleven blankets, still she continued to complain of cold. Beef tea became her almost only support, which was usually given to her boiling from the fire; notwithstanding, she would often say it was cold, and request them to boil it again. There was an unnatural curvature of the superior part of the spine, and she had constant head-ache. The bowels were constipated, nor were they ever evacuated, without her having taken aperient medicine, and she would frequently cry for hours together.

Three years before the time that I was consulted, she had been in London under the care of a gentleman generally considered the first surgeon in Europe, and such was his opinion after he had seen her daily for six weeks, that he

requested her mother to take her home, at the same time stating, that she would not live many weeks. To cut short this case, which must have become tedious by this time, I have only to say, that she was placed under my care, and in six months she could walk six or seven miles without resting, and at the expiration of eight, she could discover any object whatever. I do not mean to say that she could see as well as if she had not been previously affected, but sufficiently well to know persons, and what they were dressed in, and also the head from the point of a pin.

The next case that I have to notice, is one of a gentleman, 33 years of age, who is an architect. He stated that three years and a half ago, he found himself quite incapable of following his business from loss of vision. When he first perceived an alteration in his sight, it would frequently, when reading, appear as if a piece of fine net-work was before him; at other times, it would appear as if there was a blank space, and very frequently small sparks of fire would appear to dart through the eye. This patient was of a very delicate constitution, light complexion, and blue eyes, and his habits particularly regular. When he placed himself under my care, he said he had been six months under the care of a most respectable oculist in London, who had certainly done him a great deal of good, but could not get him beyond a certain ratio. This state appeared to him worse than actual blindness, as he was unable to distinguish any thing clearly, owing to a thick fog, which he said was always before him. In six weeks this gentleman, after he became my patient, could read any small print by taking great pains; and in four months he was entirely cured.

The next case, I am sorry to say, is one of those which, as I have said before, resists all remedial means, and as the patient is waiting below, I will introduce him to your notice. —He is 34 years of age, a joiner by trade, and has been

blind four years.—The cause of blindness is evidently within the cranium, and you observe that he is unable to stand steady, although he is endeavouring to support himself by his stick. The first knowledge he had of his sight being diminished, was one day when he was examining a piece of board with the eye he was unaccustomed so to do that he had been planeing ;*—he shortly after became occasionally giddy, and it became more severe after frequent large bleedings. He was taken into the London Hospital, was bled, salivated eight or nine times, and perpetual blisters were applied over his head. He was afterwards taken into the Borough Hospital, and was again salivated, blistered, and tarter emetic ointment rubbed all over the head. He removed himself from this hospital, and applied to the Moorfields' Eye Infirmary, when he was again salivated and cupped on the temples. I must here remark, that upon every application of the cupping glasses he found himself worse, and at last it brought on a hissing sensation in the ears, with considerable increase of the giddiness. In this state he applied to me, and in about six months after, he was enabled to distinguish the difference in a person's dress, at the distance of six yards. Unfortunately, however, for the poor man, these cheering hopes of cure did not last long, for on the severe frost of the winter in 1829 coming on, he took cold, which confined him to his bed for three weeks ; and afterwards, all remedies failed to improve him.

The next is the case of a young man, 29 years of age, of short, slender figure, light hair, and swarthy complexion. Six years before I saw him he had had a severe fit of rheumatic fever, which left him in a state of great weakness. He likewise stated, that he had had a blow on the head, and from it his head, on that part, was ever afterwards tender.

* It is usual for joiners to make use of one eye only, when they wish to know if their work be even.

He had pain in his right arm, which increased so much when in bed, that it prevented him sleeping, and had been in this state from the first of his illness. He had visited Bristol, Buxton, Harrowgate, and had made several sea voyages, from which he experienced no material relief. He also had had the opinion of several highly respectable physicians and surgeons in London, but from whom he experienced only temporary relief. His right eye was much larger than the left, and much more prominent, and vision almost extinct. The corner of the mouth of the same side was drawn towards the opposite one, and he had a difficulty in articulation. A little before he applied to me, he had been advised to be cupped, which brought on a sickness and giddiness that prevented him from either standing or sitting upright. This young man was cured in about fourteen months after he was placed under my care. The next portion of this beautiful piece of mechanism, that I have to notice is *the vitreous humour*; and it is this highly transparent substance that I hold in my hand, and which I have endeavoured to represent in the diagram, plate II., fig. 15: it is surrounded by the retina, and by a transparent membrane, called the hyaloid membrane. This membrane is formed into cells that contain a transparent fluid, as will be clearly demonstrated by my cutting it across with the scissors, or any sharp instrument. The external lamina of the hyaloid membrane, is attached to the internal surface of the retina forming a circle called zonula ciliaris. Between this ciliary zone and that portion of this membrane which covers the crystalline lens, a canal is formed, called the canal of petit; see diagram, plate II., fig. 16. I will show this canal by introducing a blow-pipe.

Situated upon the superior portion of the vitreous humour, and covered by a capsule, is this transparent body, called crystalline lens; vide diagram, plate II., fig. 17. It is a solid,

lentiform body, and bears some resemblance to ice. This substance, or the capsule that covers it, is liable to become opaque, constituting the disease called cataract. When the opacity is fully formed, surgeons generally remove the diseased part by an operation, three varieties of which are resorted to, according to the circumstances of the case: two of these varieties I will perform on the eyes now before us. The first operation, above alluded to, is named couching; meaning a depression of the lens into the vitreous humour, and the second extraction, or a removal of the lens through the transparent cornea.

The third manner of operating for cataract, is called keratonyxis, but formerly received in this country under the name of Saunders' operation. This mode of operating is much more simple than either couching or extraction; and, if it was suitable for all cases of cataract, the others would be entirely laid aside. Keratonyxis, is simply passing a needle through the transparent cornea, or through the cornea opaque, as in couching, and dividing the capsule of the crystalline lens, and afterwards the lens itself if it be thought necessary, which is to be brought into the anterior chamber for absorption. The absorption will be accomplished in eight or ten weeks, and in some persons much earlier.

Before you commence any of the above operations, it will be necessary that you should furnish yourselves with proper instruments; and as regards myself, I prefer the kind that I am about to use, and which are laid on the table before you. Not only should you provide yourselves with proper instruments, but you should also take care that the patient is in a proper state to undergo the operation, and that the case is one that will admit of benefit from it. Many writers on operative surgery recommend the patient to be placed in a chair without a back, and so low that the head

of the person about to undergo the operation, should be on a level with the breast of the operator.—Stools and various other apparatus have been contrived in order to place the patient in a good position, but, as far as regards myself, I prefer the recumbent position to every other.—The first operation of this kind that I ever witnessed, the recumbent position was selected, and being attended with such apparent ease to the patient, and convenience to the surgeon, I have always chosen it. Having satisfied yourselves of the necessity of the operation, and taken into consideration the requisites previously mentioned, you may perform the operation for extracting the lens in the following manner:—The eye having been fixed, you must introduce this knife, called the cornea knife, into the transparent cornea, about this distance, that is, one-twelfth of an inch, from the cornea opaque, and on a level with the centre of the pupil. The knife must then be carried forward to the opposite side of the cornea transparens, which, when thoroughly cut through, the knife must be withdrawn, and this needle introduced, in order to make an opening in the capsule of the lens. When a sufficient opening has been made in the capsule, you must withdraw the needle, and shade the eye, in order to allow the pupil to dilate, after which, you must press the eyeball very gently either above or below, and the lens will pass out, as you now observe. The operation for depressing the lens is a much less difficult one than that of extraction, and must be performed in the following manner:—This needle, which I have now in my hand, called the couching needle, must be passed through the sclerotic coat about the sixteenth part of an inch from the cornea lucida, in an horizontal direction, taking care not to bring it in contact with the iris, or the ciliary nerves, or arteries; when you can see the point of the needle in the centre of the eye, through the pupil, you must depress it so as to fix it in the lens, and by

raising the handle of the instrument you will press the lens to the bottom of the vitreous humour. When this part is accomplished, you may then withdraw the needle and close the eyelids, upon which you must apply a soft compress, and keep it constantly moistened with a refrigerant lotion. It will be right for me here to observe that sometimes the lens will regain its former position, but this will be occasioned either from the patient not observing the directions given, or from it not having been properly detached from its capsule: when this does happen, you must again resort to the operation, which may be repeated several times, if required, with perfect safety to the patient. The proximate cause of cataract remains in great obscurity; consequently, the general opinion of surgeons is, that a remedial plan of treatment is useless. As regards myself, I cannot subscribe to those opinions altogether, knowing, as I do from experience, that cataract may sometimes be prevented from progressing, and at other times entirely dispersed.

Let me not be understood, from the preceding remarks, to mean, that all kinds of cataract may be dispersed; on the contrary, I am most willing to allow, that the operation in some of those cases is our only hope. The first case of cataract that I may venture to say I dispersed, occurred to me about five years ago. The patient was a tall, thin man, black hair, and swarthy complexion. He stated that his sight had been decreasing three years; and that at the present time (that is when I first saw him), he could see nothing distinctly except out of the corner of his right eye. He had had the opinion of several surgeons in London, also in the country, and they informed him it was cataract.

On an examination, the aqueous humour appeared dull, having the appearance of muddy water, and in the centre of the pupil, posteriorly, there appeared a small round white

substance. I must admit, that when I took this gentleman under my care, I had little or no hope of success; but he having felt desirous of trying any measures in preference to an operation, I was induced to persevere in the plan of treatment that I had suggested. This patient could read large print in twelve months after I had began to attend him.

The next is the case of a young lady, eighteen years of age, black hair, pale complexion, and rather bulky in appearance. In the fourteenth year of her age her eyes became considerably inflamed, which continued more or less to affect her for eighteen months. Between the various intervals of inflammation she found great difficulty in making out objects, and in nine months from the commencement of the inflammation she became unable to distinguish any thing further than day from night. Although much inflammation had existed for the length of time above specified, yet none of the textures appeared to have undergone any important change except the lens or its capsule. On a slight examination of the eye nothing of importance could be discovered, and it presented more the appearance of amaurosis than cataract. When examined with a microscope, the opacity was discoverable, presenting an appearance in colour something like dark slate. The amendment in this case was very tedious, but progressive, and in eighteen months she was cured.

The next case that I have to notice is a person, thirty-four years of age, tall, spare habit of body, melancholy temperament, and his occupation sedentary. He stated that he had always a defect in his vision, requiring the book, or object that he was looking at, to be placed at a greater distance than persons do in general; this was the condition of his sight until he became twenty years of age, and at this period objects became less plain, and they required to be placed at a much less distance than before.

He was advised to make use of spectacles, which were of great advantage for ten years, but afterwards they began to lose their good effects, and in three years he became blind. In 1827 he placed himself under my care; and, at the latter end of 1829, he could read large print without the assistance of spectacles.

The next, is the case of a child, two years and a half old, which caught cold in the second week from its birth, and from which circumstance both eyes became very much inflamed. The inflammation of the right eye yielded to the remedies prescribed by a very skilful surgeon who was then in attendance; but that in the left eye run on, undiminished in severity, for a very considerable length of time, and at last terminated in effusion of a milky substance* into the chambers of the eye, and which afterwards became turbid, so as to entirely destroy vision. When the child was of the age above mentioned, accidental circumstances brought me in connexion with the family, and the child was placed under my care, although I informed the parents that I was doubtful as to the result. This little patient was enabled in six months to see objects indistinctly, and in nine months from my first attendance this eye became perfectly clear.

The next and last case of this kind that I shall at present mention, is a lady, fourteen years of age, of sprightly, animated countenance, and very fair complexion. When in her ninth year she began to have repeated attacks of inflammation in the eye, accompanied with pain, and also great pain in the head. After having had various attacks of inflammation, and when apparently free from them, she would constantly see little black spots floating before her, and all objects on which she looked were very much obscured. On examining the eye, the iris appeared more forward than natural, and almost motionless; the aqueous

* This change is called by pathologists, hypogala.

humour turbid and of a milky appearance, and in the centre of the pupil, posteriorly, there was a projection about the size and colour of a small pearl. Under a modified plan of treatment from the former patient, this lady recovered her sight in the space of nineteen months.

The preceding cases are, in my opinion, sufficient to convince you that cataract is not a disease altogether irremediable; and I am strengthened in my conviction from constant experience, as well as in reflecting of the complete manner in which the lens is absorbed, after having been removed from its situation, or when its capsule has been lacerated.

The absorbent vessels of the eye appear to be exceedingly active in the removal of substances deposited in the chambers of the eye, or otherwise, provided those depositions are free from nutrient vessels, as is clearly demonstrated in the absorption of the lens after the operation of couching, or keratonyxis. From the preceding remarks it appears probable, that by restoring the healthy action of the secretory organs, and at the same time increasing the action of the absorbents, and particularly those of the eye, this disease may be prevented from progressing, and in some cases entirely removed. Experience of almost all individuals lead you to believe to the contrary of the above, but I beg leave to recommend you seriously to consider the cases above stated, and also to endeavour to combine remedies that will effectually answer the above intentions.

In a previous part of this lecture, I have stated that the proximate cause of cataract remains in great obscurity; notwithstanding, from the knowledge we possess of pathology in general, we may venture to attribute it sometimes to inflammation of the part; and, at other times to considerable inaction of the absorbents of the eye, thereby admitting depositions to take place, which these vessels are afterwards

unable to take up. Much more might be said on the theory of cataract, but as I should be compelled to intrude upon your time much longer than I feel it my duty so to do, I shall defer the subject to some future opportunity, and therefore proceed to consider the remaining parts of the eye, which have not as yet come under my notice.

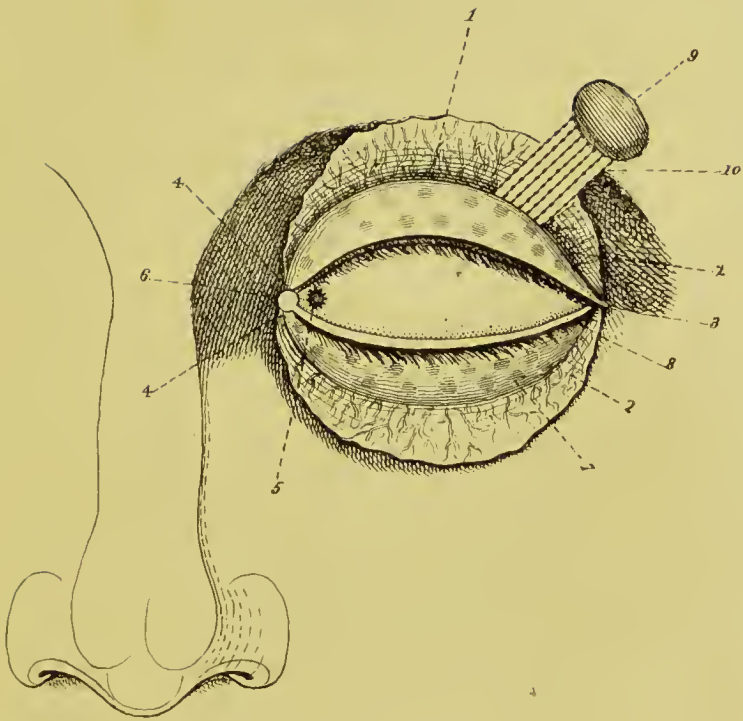
The space between the transparent cornea and the crystalline lens is denominated the chambers of the eye, and is divided into anterior and posterior. That part which is situated between the transparent cornea and the iris, vide diagram, plate II., fig. 18, is called the anterior chamber; and that portion which is situated between the under surface of the iris, called uvea, and the crystalline lens, is called the posterior chamber; see diagram, plate II., fig. 19. These chambers are filled with a peculiar fluid, called the aqueous humour, which is secreted by the vessels of the *corpus ciliare*, in conjunction with the exhaling vessels of the iris. This fluid is of vast importance in assisting the eye to perform its proper functions, and also towards properly refracting the rays of light which pass through it to the lens, and thence to the vitreous humour, to be afterwards reflected upon the retina or expansion of the optic nerve. A superabundant, or an insufficient quantity of this fluid will greatly affect the focus of vision, and thereby assist in producing the diseases called myopia and presbyopia. In many cases of amaurosis, when the ciliary nerves have participated in the affection in common with the retina, I have found the aqueous humour much diminished, and an increase of this fluid has always been attended with the happiest result. This fluid is liable to be affected with various diseases, two of which I will here mention:—the one called *hypopium*, and the other *hypogala*. The first of these words above-mentioned, signifies pus mixed with the aqueous humour; and the second, a milky fluid secreted

by the secretory organs of these parts instead of a perfect transparent fluid.

The eye is supplied with blood by vessels from the internal carotid artery, which pass into the cranium, through the foramen carotideum. When the carotid artery arrives at the anterior clinoid process of the sphenoid bone, it gives off the ophthalmic, see diagram, plate II., fig. 20, and this sends off the centralis retina, the ciliary, the lingualis, muscularis, superior orbital, anterior and posterior oethmoidal, and the angularis. The blood is afterwards returned by veins corresponding to the above arteries, which terminate in the external jugular vein. This vein empties its blood into the subclavian, and the subclavian into the vena cava superior. Besides the optic nerve, the *nervi oculorum motorii*, the *pathetici*, and also a branch or two of the *trigemini*, assist in supplying the eye and appendages with nervous power.

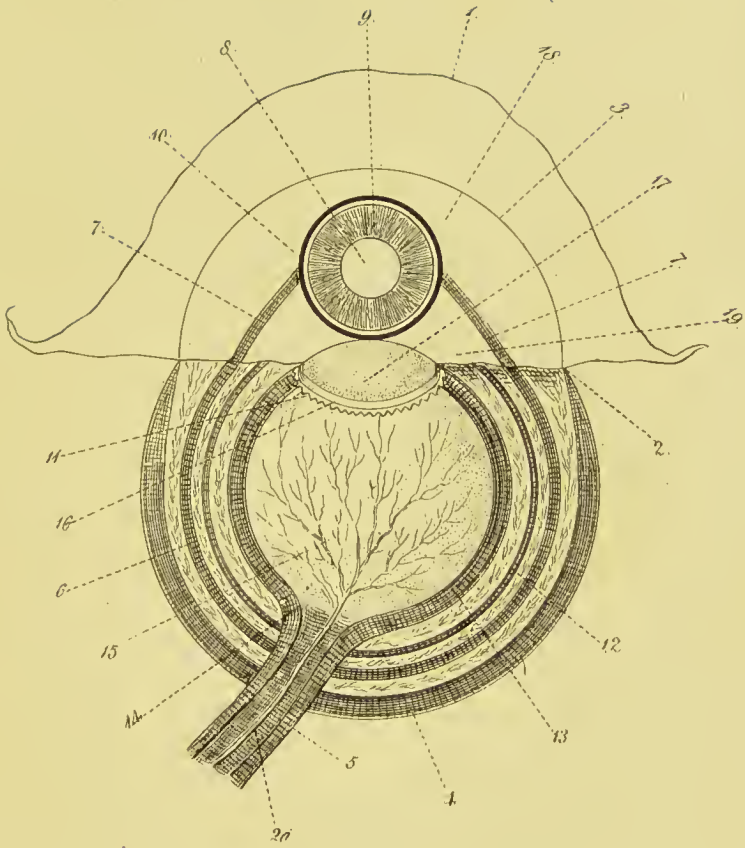
Having noticed the various parts that enter into the formation of the human eye, and having made a few physiological and pathological observations, I must defer any further remarks to a future Lecture, finding, by the hour of the night, that I have already trespassed on your time three quarters of an hour longer than I had intended. In conclusion, allow me to return you my sincere thanks for the universal attention shown me on this, as well as on all former occasions, and to assure you that it will be the proudest hour of my life to see this Society fulfil the objects of its founders, viz. the improvement of medical and surgical knowledge.

Plate 1.



T. Firth Esq.

Bottomley & Aughton lith



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B Y T H O M A S G A T A K E R,
Physician-Extraordinary to her Royal Highness the Princess of WALES,
and Surgeon to St. GEORGE'S-HOSPITAL.

L O N D O N :

Printed for R. and J. DODSLY, in Pall-Mall; and
G. HAWKINS, at Temple-Bar, 1761.

DEDICATION.

In compiling the anatomical part of these Lectures, I endeavoured to collect the principal articles of this interesting subject, and to form such an account of the eye and eye-lids as might convey a clear and comprehensive idea of their structure and uses without being tediously circumstantial.

If I have succeeded in my design, as I am encouraged to hope, the trouble I took on the occasion may probably, by this publication, be useful to those who are in pursuit of the same knowledge.

I am,

GENTLEMEN,

With due regard

Your most obedient Servant,

THOMAS GATAKER.

FIRST LECTURE.

T H E

I N T R O D U C T I O N.

TH E subject I have chosen for the following Lectures, is the structure of the eye and eye-lids; a subject which, from its importance in regard to the diseases of these parts, and from the difficulty of acquiring a perfect knowledge of it, will, I imagine, very properly admit of being often explained.

As the employments and the pleasures of life depend, in a great degree, upon the faculty of seeing, whatever may interrupt or destroy the use of that faculty deserves our utmost attention. Agreeable to this opinion, we find in all times, that the disorders which affected the sight were considered as objects of importance. Anatomists have taken great pains in discovering the structure of the eye; the arts of physic

B

and

and surgery have been employed to remove or alleviate the diseases of this organ; and to these assistances has been added the result of philosophical enquiries, which, by explaining the nature of vision, have pointed out the means of relief in some cases, wherein neither medicines nor manual operations avail.

With all these advantages, it may seem extraordinary to assert, that disorders of the eye are frequently treated with far less propriety than many other complaints of a much less interesting nature.

May I be allowed here to mention some of the reasons which induce me to form this opinion?

If we look into the accounts given of the diseases of the eyes, we shall find, that most authors, who have written at large and professedly upon this subject, seem fond of making numerous distinctions of the complaints, and of bestowing particular appellations upon them; multiplying them by the means into such an useless and perplexing variety, that the disorders of the eyes and eyelids are made by some writers almost equal to all the other distempers which ever affected the

human

human body. But whatever indulgences of this sort a creative fancy, or a motive less justifiable may induce a writer to take, it ought to be considered, that all distinctions and subdivisions upon these occasions, which are not essentially useful, are in reality prejudicial: they load the memory, and confound the judgment of the unexperienced, and by filling the mind with false and trifling ideas, they prevent to some degree the more plain and necessary circumstances from being properly attended to. In the treatment of tumours formed upon the eye-lids, of what consequence can it be to know, whether any of them resemble a barley-corn, a gravel-stone, or a hail-stone? In the description of some disorders of the eye itself, what an unnecessary and perplexing trouble must it be to determine the figure and size of certain appearances? as whether they are formed like the nail of a man's hand, or like the wing of a bird? or whether they resemble a grape-stone, a small apple, the head of a nail, or the head of a fly? Yet such kind of distinctions are to be met with in writers of the greatest eminence.

Another circumstance to which the want of

success in these cases seems to be often owing
 is, that they are frequently of so complicated
 nature as to be incapable of relief, without the
 united assistance of physic and surgery. Upon
 such occasions, if a practitioner is unskilled in
 either of those professions, and wants opportunity
 or inclination to procure any additional
 help to his own knowledge and judgment, the
 patient must necessarily lose part of that benefit
 which the circumstances of his case would have
 allowed. The same disadvantage indeed may
 prevail more or less in the treatment of com-
 plaints incident to some other parts of the body;
 but here the observation serves at least to account
 for the little real advantage attending the gen-
 eral practices and extraordinary boasts of oculis-
 tists. The merit of most practitioners of this
 class consists chiefly in knowing something
 of the anatomy of the eye, and in the perform-
 ance of one or two particular operations: in
 respect to the more comprehensive branches of
 physical knowledge, as they rarely have a
 reasonable pretence to these, so their conduct is
 seldom ingenuous enough to make them either
 desire or deserve the advantage of such knowl-
 edge from those who possess it.

To the reasons already assigned may be added the following one, which relates more immediately than the others to the business of the present lectures. Some practitioners may not have that thorough knowledge in the structure of the eye, as to enable them in all cases to treat the several disorders of this organ with that judgment and propriety with which they would execute many other parts of their profession. The study of anatomy, it must be owned, has of late years been very much cultivated, and the methods of teaching it have been much improved: but notwithstanding the progress which many students make in this very useful branch of physical education, many of those who attend anatomical courses cannot, I conceive, be reasonably expected to receive from thence all the benefit that could be wished. The time and opportunities which they are allowed for this improvement, are very often unequal to the design. A multiplicity of things are to be learnt; many of them are very minute; and it is extremely difficult to comprehend them perfectly, and to fix them all in the memory from one or two transient views, though accompanied with the most exact and

ingenious descriptions. A moderate share of knowledge may be acquired by this means in the gross anatomy, but when the finer organs of the body become the objects of attention, greater difficulties occur: repeated examinations and explanations are then necessary, in order to understand perfectly the structure and uses of these delicate parts, and to impress a lasting idea of them upon the mind. Shall I assert too much in saying, that the want of these opportunities of improvement, by repeated inspection and explanations of the parts, is not so well supplied by books as the subject seems capable of? For though there is very little known in anatomy that has not been given to the public, yet the manner in which this knowledge has been communicated, makes the acquisition of it in some instances very difficult to persons who are little acquainted with the subject. Thus, in respect to the structure of the eye, we find some writers have been so concise and imperfect in certain articles, as by no means to answer the full intention of such descriptions: others have been more elaborate and exact, and very much deserve our acknowledgments and attention; but

TO THE FIRST LECTURE. 7

In some particulars, I presume, are more diffuse and circumstantial than is generally necessary. The account is also frequently complicated with critical discussions; perplexed, like most other articles in anatomy, with an useless multiplication of names and distinctions; and when particular parts of the eye are described, as is often done, among other things that have not any immediate connection with it, there is not that methodical arrangement of the several parts which leads best to a regular view of the whole.

Though unequal, I fear, to the task of removing every difficulty from the subject, I shall endeavour, at least, that the following Lectures may be as little liable as possible to the objections which I have taken the liberty of making in the preceding paragraph.

The substance of these Lectures will consist, as was before intimated, of a description of the eye and eye-lids; to which will be occasionally added some few remarks relating to the diseases of these parts, and an explanation of the nature and uses of eye-waters, ointments and liniments for the eyes.

Description of the Parts.

T H E E Y E - B R O W S.

PREVIOUS to the description of those parts which more immediately and principally constitute the organ of sight, it may be proper to say a few words on a neighbouring part, the eye-brow.

The eye-brows are raised a little above the even surface of the forehead, by the thickness of the adipous membrane which lies underneath them and by the shape of the frontal bone in that part. The form and substance of the eye-brows are in general too well known to require any particular description: In different persons they have indeed some peculiarities in regard to their form, and likewise to their size and colour; but these differences, though they often relate essentially to the beauty and expression of the countenance, are not the proper objects of the present account.

The eye-brows admit of two motions, depression and elevation. The first of these is performed

formed.

formed by a muscle peculiar to the eye-brow, and is termed depressor or corrugator supercilii. This muscle is adherent to, and covered by the inferior portion of the frontal muscle, of which it is reckoned by some to be an elongation. It takes its origin in the great angle of the eye, from the superior part of the nasal bone, and running obliquely upwards, is inserted tendinous into the skin of the brow.

The use of this muscle, when it acts singly, is to move its respective eye-brow downwards; but when both these muscles act together, the brows are drawn nearer to one another at the same time that they are depressed. In this action, the skin that covers the lower part of the forehead between the eye-brows, and that which covers the upper part of the nose, is drawn into wrinkles of different directions, as particularly seen in frowning. The eye-lids are likewise brought closer by this action, and the eyes, it is supposed, are thereby in some degree occasionally defended from dust or other small bodies floating in the air, as well as from the glare of a very strong light.

The elevation of the eye-brows is performed by the frontal muscles, whose fleshy fibres co-

ver the anterior portion of the frontal bone, and are partly inserted into the skin of the brows. When these muscles contract, they draw up the eye-brows, and at the same time wrinkle the skin of the forehead and move the scalp.

The eye-brows receive blood-vessels from the temporal and frontal arteries; and nerves from a branch of the fifth pair of nerves. This branch, accompanied with an artery proceeding from the internal carotid artery, runs along the periosteum lining the socket of the eye, and passing through the superciliary hole or notch of the frontal bone, is partly bestowed upon the eye-brow and its muscles.

In respect to the general uses of the eye-brows, they are said to intercept the rays of strong light falling in some oblique directions from above; but though probably they are seldom of much service on this account, they are certainly very useful in preventing rain, sweat or other moisture from running immediately off the forehead into the eyes: this they do, by directing the course of such moisture either along the sides of the nose, or down the temples.

It might seem proper likewise in this place

a preliminary article to the following description, to give some account of the orbit or bony socket, in which the greatest part of the organ of sight is contained: but as the general form and the general use of this bony cavity are well known, and as several bones contribute to the formation of it, which are subservient likewise to other purposes, a regular description of it here will be omitted. In the course of the following account, different parts of the socket will necessarily be mentioned, and whatever relates in this respect essentially to explaining the present subject, shall be occasionally observed. The next parts to be considered therefore are the eye-lids.

T H E E Y E - L I D S.

TH E eye-lids are connected to the circumference of the socket by the tunica conjunctiva, which will be particularly described hereafter with the coats of the eye. It is necessary, however, to observe here in general of the tunica conjunctiva, that it is a very smooth and fine membrane, which lines the internal surface of the eye-lids, and from the edge
of

of the socket, to which it adheres all round, is reflected upon and covers the anterior half of the globe of the eye.

The eye-lids are composed of the common teguments, a cartilage called tarsus, and an internal membrane. They have two angles or corners, one the small or external, the other the large or internal angle. The form of each eye-lid is that of a segment or portion of a circle and in regard to the eye is such, that when both eye-lids are shut they make a uniform arch adapted to the convexity of the eye, and in contact with it: but in regard to one another when shut, their edges are so contrived, that they leave a sort of groove or channel between them, which is narrow towards the outer angle, and wider towards the inner, and serves to conduct the tears as they come from the upper part of the eye, to what are called the lacrymal points. The margin of each eye-lid being of considerable thickness, is divided into the outer and inner edge. It is the outer edge only of each lid that is supposed to join when the eye-lids are shut; the inner edge being formed oblique or slanting, makes the

groove

roove or channel just mentioned for the passage of the tears to the lacrymal points.

The outer edge of each eye-lid is furnished with a row of hairs. These hairs are designed to prevent dust or other small bodies flying in the air, from being admitted to the ball of the eye, by the immediate warning which they give to shut the eye-lids when any such bodies touch them. They serve likewise in some measure to defend the eyes against the impressions of very strong light. The loss of these hairs, which happens sometimes from disorders in the lids, shews the utility of them in their natural state and situation. The eye-lids, in such cases, are often disagreeably irritated, even by the common light, and are kept almost in constant motion, either on that account, or to prevent dust or other small substances from being admitted and lodging upon the eye.

On the internal edge of each lid is a row of small holes, which are the excretory ducts of what are termed the ciliary glands. These glands, which are likewise distinguished by the name of Meibomius's glands, appear of a whitish colour, and are situated on the internal surface

surface of the eye-lids, immediately under the tunica conjunctiva. Their ducts, which are extremely short, open at the internal edge of each lid, and when squeezed, yield a kind of oily or unctuous matter. This matter is supposed to be of use in preventing the attrition of the eye-lids from their frequent motion and by keeping their edges moist and soft, it serves in a great degree to hinder them from being inflamed and excoriated, and from adhering to one another.

Under the external teguments of the eye-lid is the thin cartilage, called tarsus, which forms the chief part of the edge of each lid. The tarsus of each lid is different in respect to its breadth and figure. In the lower lid it is narrow, and nearly of an equal breadth all along; in the upper lid it is broader in general than the lower, and rising in its middle and superior part, is of a semilunar shape. From the superior edge of the upper tarsus, and the inferior of the lower, is continued a membranous expansion to the neighbouring edge of the orbit. Each of these membranes together with its respective tarsus, has the form of the eye-lid to which it belongs, and is called *ligamentum tarfi*. T

are concave towards the globe of the eye, and convex on the other side; and upon their internal surface are transverse channels for the reception of the ciliary glands before-mentioned. By the firm substance of the lids, and by their form, they serve to strengthen and to keep the lids smooth, and equally extended, so that they may be freely moved in every part; and they make that arch by which the internal surface of the eye-lids is adapted to the convexity of the eye.

The inside of the lids is lined with a fine and very sensible membrane, which is a portion of the tunica conjunctiva, as has been already observed and as will appear more particularly hereafter.

The muscles subservient to the motions of the eye-lids, are the musculus orbicularis, and the levator palpebræ superioris.

The musculus orbicularis surrounds and covers both lids. The origin of this muscle is at the great or internal angle of the eye; and the fibres of it spreading from thence and covering the lower lid, proceed on to the outward or lesser angle: passing round this angle they are continued over, and cover the

the upper lid, and then terminate at the greater internal angle where they began. This muscle has a slight ligamentary tendon, which extending transversely from the nasal process of the maxillary bone towards the internal angle of the eye, and appearing like a white line, terminates at the union of the lacrymal points.

The use of this muscle is by its contraction to bring the upper lid downwards, and pull the lower lid upwards, by which means both lids are drawn together so as to shut upon the eye.

The levator palpebræ superioris arises from the bottom of the orbit by a small tendon; and the fleshy fibres of this muscle pass over the globe of the eye, they gradually spread, and afterwards terminate by a broad tendinous expansion in the superior part of the tarsus belonging to the upper lid. The use of this muscle is to open the eye, by drawing the eye-lid upward.

The integuments of the eye-lids, and the orbicular muscle, are furnished with blood by ramifications from the angular, temporal, and frontal arteries; and these communicate with branches that are sent to the internal membrane of the eye-lids. The levator palpebræ superioris receives a ramification from a co-

siderat

derable branch, which is sent through the inferior orbitary fissure from the internal maxillary artery, and is distributed to this and several other parts of the eye.

The veins of the eye-lids correspond pretty nearly with the course of the arteries, and emptying themselves into the neighbouring veins of the temples and face, have their blood carried by them into the external jugulars.

The eye-lids are supplied with nerves from the ophthalmic branch of the fifth pair. The orbicular muscle of the eye-lids receives nerves from the same branch; likewise from another branch of the fifth pair, called the superior maxillary branch, and from the portio dura of the seventh pair.

The levator palpebræ superioris receives a branch from the third pair.

The eye-lids serve as a veil or curtain, which may be closed or opened at pleasure by the action of their muscles. When they cover the eyes intirely, as in sleep, they exclude the light, which otherwise would hinder rest. They prevent the eyes from growing dry and uneasy, and defend them from being injured by a

variety of small bodies which might fall upon them from the common air. Even the softest, purest air, and the mildest light, would create very painful sensations in the globe of the eye, if it was intirely divested of this most useful covering. In the day, the eye-lids form a sort of shade, and occasionally moderate the influx of light into the eye. The frequent motion of them serves also to spread the tears or lacrymal fluid over the anterior surface of the globe of the eye, and by that means washes off and cleanses it from any foulness which may have been collected there. By the same means the transparency of the cornea is preserved. Nor is this frequent motion of the eye-lids, which is so necessary for the purposes just mentioned at all inconvenient in respect to vision; as the quickness of the motion prevents its being any continued and perceptible obstruction to the free passage of the rays of light into the eye.

The eye-lids are subject to little tumours either in their substance or on the surface of them, which fanciful writers have divided into several kinds, and have distinguished by particular names from a resemblance which they conceived they had to some other things.

things, as hail-stones, barley-corns, &c. Of these it is sufficient to say, that a person who is well acquainted with the structure of the parts and with the plain rules of surgery, will find very little difficulty in the treatment of them, further than the common difficulty of handling or applying dressings to parts which are constantly in motion, as well as contiguous to so tender an organ as the eye. But there is one complaint of the eye-lids, which may deserve more particular mention in this place. This disorder chiefly affects the ciliary glands, and is the occasion of that redness which is sometimes observable along the edges of the lids, attended with excoriation, and a discharge of humour. Different methods may be properly directed for the cure or relief of this disorder in different circumstances of it; but there is one which is not so generally attended to as others, and which in some instances has been found successful, after other means, both internal and external, have proved ineffectual. The prudent use of the lunar caustic to the parts has answered this purpose; probably by very powerfully constringing and strengthening the secretory ducts of the ciliary glands, which

a long determination of humours to them has relaxed and enlarged; and by drying up and healing those excoriations of the orifices of these ducts and of the neighbouring skin, which have been produced by the discharge.

The parts next to be considered are the lacrymal gland, the lacrymal points, and the lacrymal bag; the first serving to secrete the lacrymal fluid to be diffused upon the anterior surface of the eye, the two last serving to carry off this fluid after it has answered the purposes for which it was separated. To these may be added, the lacrymal caruncle.

The GLANDULA LACRYMALIS, PUNCTA LACRYMALIA, SACCULUS LACRYMALIS and CARUNCULA LACRYMALIS.

GLANDULA LACRYMALIS. In the upper part of the socket, a little above the external angle, is a depression which receives the superior part of the glandula lacrymalis. This gland, which was formerly termed glandula innominata, is situated behind the tunica conjunctiva, and is considerably large. It is of a whitish colour, and is composed of several

small lobes, each of which, it has been said, sends out an excretory duct. But though the number of these ducts is not easily determinable, it is certain there are such ducts, which piercing obliquely the tunica conjunctiva of the upper lid, open on the inside of that membrane, near the superior part of the tarsus.

The office of the lacrymal gland is to separate a lymph or fluid, which passes through the excretory ducts, to be diffused over, and to moisten the fore-part of the eye-ball; which might otherwise grow dry, and become painful from the friction of the lids, and the action of the air upon it. And in order that this constant supply of fluid may be properly diffused, there is a frequent motion of the lids which spreads the fluid equally. By this moisture likewise, any foulness between the eye-ball and lids may be washed off.

It is observable, that when any extraneous, irritating substance is accidentally lodged upon the eye and excites pain, an unusual quantity of this lacrymal fluid is immediately separated, and is diffused over the fore-part of the globe, in order to carry off the cause of the irritation. The assistance which nature furnishes

thus for relief of such accidents, and likewise the profusion of the lacrymal fluid, which is instantaneously separated and flows from the eyes upon sudden and violent fits of crying, are circumstances very extraordinary, considering there is not any collection or visible reserve of lymph to answer occasionally these purposes. And here, though it is not a remark essentially relative to practice, it may not be amiss to take notice, that the generality of brute animals are furnished with nearly the same apparatus for the secretion and conveyance of the lacrymal fluid, and the same purposes seem to be answered by this fluid in them as have been observed to be in man, except in the last instance. It is a quality peculiar to the human species, to shew the passion of grief by a sudden and involuntary discharge of tears; unless we admit of a few exceptions, which are imperfect in their kind, and are but barely allowable at all.

PUNCTA LACRYMALIA. Upon the inner edge of each eye-lid, near the internal angle, is a small eminence, which is perforated obliquely by a fine orifice. These orifices, which are situated opposite to one another, are termed lachry-

lacrymal points; and they serve as waste-pipes to carry off the lacrymal fluid after it has answered the purposes already mentioned, upon the anterior surface of the eye. The manner in which this fluid is directed along the groove, formed by the eye-lids to the lacrymal points, has been before taken notice of; but in order that the course of the lacrymal fluid may not be obstructed after it arrives at the lacrymal points, it is necessary that these orifices should be constantly kept open, or at least that they should never be totally closed. To this end, each of the lacrymal points is incircled by a white cartilaginous ring, the direction of which inclining a little obliquely towards the globe of the eye, they never come into contact with one another intirely; but when the eye-lids are slightly shut, the lacrymal points touch each other only at that part next the outer edge or external skin; and when the eye-lids are quite shut, they are still kept at nearly the same distance from one another, by the interposition of a small round substance in the corner of the eye, called the lacrymal caruncle.

It must be further observed, in regard to these lacrymal points, that they are the orifices

of two short ducts, which run behind the tendon of the orbicular muscle, and which uniting near the lacrymal sac, form one duct that immediately opens, beyond the angle of the eye-lids, into the upper part of the sac.

The course of these ducts, as they run behind the tendon of the orbicular muscle, may deserve consideration in respect to the operation for a fistula lacrymalis. It was long, we know, supposed, that a transverse incision of this tendon might occasion an inversion or distortion of the eye-lid; and therefore, in performing that operation, particular directions were given to avoid this circumstance. This precaution has indeed of late been almost intirely disregarded. Since, however, it is supposed by some, that from such a division of the tendon, these ducts of the lacrymal points may happen to be wounded; and as the divided parts of the ducts may possibly not heal afterwards so aptly as to admit a free passage of the lacrymal fluid through them, it should seem right to prevent this accident where it can be done with propriety. For this purpose, one of the methods which was formerly proposed of beginning the incision immediately below the
ten-

tendon, in order to avoid wounding the tendon, particularly in those cases where there is little or no external swelling, appears a reasonable practice in one respect, as it will certainly prevent a division of the lacrymal ducts.

The SACCULUS LACRYMALIS. The lacrymal sac is described to be an oblong membranous bag, and, if seen in a state of distention, has that appearance. The prints which we have of it give it likewise the same figure, representing it uniformly distended. It ought however to be observed, that in a natural state of the lacrymal sac, in which the tears have a free passage through it, the anterior side of it suffering no distention, is nearly flat. The upper part of the sac lies under the tendon of the orbicular muscle, and receives the tears from the lacrymal points by the ducts just taken notice of. Near the middle, which is the widest part of the bag, it is somewhat less than a quarter of an inch in diameter; but descending a little lower it gradually lessens, and passing obliquely backwards, terminates by a very small opening, under the os turbinatum inferius, in the cavity of the nostril. The lacrymal bag is situated just within the orbit, in a bony

bony passage, formed by the os unguis and the os maxillare. The length of this passage is about three quarters of an inch, the greatest part of which is to be considered as a groove, the anterior surface of the bag for about the space of half an inch, not being covered with bone. The remaining narrower part of the passage is formed into a complete canal, which incloses the contracted and shorter part of the bag, as it passes into the nostril.

Whoever duly considers the situation of the lacrymal sac, as it lies in the passage just described within the edge of the socket, will perceive, I imagine, that a proper compression of the sac (however useful such a compression might be, could it be easily made) is not generally so practicable as some have thought it to be in the cure of a fistula lacrymalis. Less still will be expected from this method of compression, when it is considered, that the disease generally beginning with an obstruction in that part of the passage which forms the complete bony canal above-mentioned, this obstruction must be first removed before any effectual progress can be made by other means towards a real cure of the disorder.

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The structure and uses of the parts described in this and the preceding article, ought, in general, to be strictly attended to, in order to conceive rightly of the operation for the fistula lacrymalis. Many other circumstances are necessary to be likewise attended to in regard to the management of that complaint; but as these have been treated of by the best of our modern writers on the operations of surgery, and as the subject has been elaborately considered very lately, I am precluded from saying more upon it at present.

CARUNCULA LACRYMALIS. The lacrymal caruncle is situated between the internal angle of the eye-lids, and the ball of the eye. It is a small reddish substance, and has the appearance of being fleshy, though it is thought to be glandular. It is said to have a great number of very fine hairs upon its surface, and to be covered with an oily, yellowish matter, not unlike that which is discharged from the ciliary glands. These hairs, it is supposed, serve to keep and prevent any feculencies or extraneous substances from entering into, and obstructing the lacrymal points; a use that is ingeniously and properly applied, if the existence of these hairs was

was really ascertained. The caruncle itself, as was intimated in the preceding article, by its situation in the corner of the eye, serves to prevent the internal edges of the lids at that part from ever coming quite into contact with one another; and thereby the orifices of the lacrymal points being to a certain degree kept open, the tears or lacrymal fluid pass freely through these points into the sac.

The lacrymal gland, points, bag and caruncle, receive arteries from the maxillary and temporal branches, and nerves from the optic branch of the fifth pair.

T H E

ECONDLecture.

Of the form and coats of the Eye, and of
the Optic Nerves.

THE figure or natural form of the eye is that of two unequal portions of unequal spheres. The portion of the smaller sphere is situated anteriorly; the portion of the larger sphere makes the posterior part of the eye. If the eye had been one sphere, the distance from the cornea through the center of the eye to the retina would have been so short, that the focus of the rays of light would have fallen beyond the eye, and vision would have been confused.

In considering the particular parts of the eye, they may be divided into the coats and the humours; to which may be added, the muscles.

Of the Coats of the Eye.

The coats of the eye are the tunica conjunctiva, or adnata; the sclerotica and cornea;

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nea; the choroides with the uvea or iris; and the retina. To these may be added, the capsular tunics of the crystalline and vitreous humours, which will be taken notice of in the description of those humours.

The Tunica conjunctiva.

Some anatomists divide the tunica conjunctiva, adnata, or as it has been sometimes termed, though improperly, albuginea, into different membranes. One of these is said to be a continuation of the periosteum lining the socket, the other a continuation of the internal membrane of the eye-lids; both of them are said to pass from the edge of the socket over the anterior part of the eye to the termination of the sclerotica in the cornea; and likewise to be covered with an extreme fine membrane, proceeding from the scarfskin of the eye-lids. But without pursuing any further account of these, it may be sufficient to observe, that though the conjunctiva may sometimes admit of being divided into distinct laminæ, as may be done in other membranes where no such distinction is observed, yet as the division

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ere is far from being easily practicable, and
the distinction does not appear to have any
al use, it may be properly ranked amongst
e many other articles which can serve only to
urthen the memory.

The tunica conjunctiva, therefore, the origin
which is not well determined, may be
nsidered as one membrane, which lines the
ternal surface of the eye-lids, and which, from
e edge of the socket, to which it adheres,
reflected upon, and covers the anterior half
the globe of the eye; the part of this mem-
ane which lines the lids being distinguished
the conjunctiva of the eye-lids, the portion
it that is spread upon the globe, as the con-
junctiva of the eye. The conjunctiva of the
e-lids adheres closely to the internal surface
the tarsus. It is full of capillary blood-
sels, which appear very plainly, and it is
l to be perforated with numerous small ori-
es, through which a lymph constantly
ses, serving with the tears to moisten the in-
e of the eye-lids, and the anterior surface of
eye. This portion of the tunica conjunc-
is endued with a remarkable degree of sen-
sibility, as is known by the extreme pain which
some-

sometimes ensues from dust or other irritating substances accidentally lodging upon this part. The conjunctiva of the eye, which adheres all round to the edge of the socket, and from which circumstance probably it has been supposed to have its origin from the periosteum lining the socket, is loosely connected to the eye by a reticular substance, as far as where the sclerotica is said to terminate in the cornea. Here it has been thought that the conjunctiva ends, or changes its nature and becomes one with the cornea; but by a careful dissection may be separated from the whole surface of the cornea.

It may be proper to add here, that immediately under and adherent to the conjunctiva of the globe, is situated the tendinous expansion of the four strait muscles of the eye; which expansion by its internal surface adheres closely to the forepart of the sclerotica, and covering all that part of the globe which appears white, terminates at the edge of the sclerotica. Some have given the name of tunica tendinea to this expansion. It is the colour of this tendinous substance, and of the anterior part of the sclerotica, in which at last this expansion

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It, that chiefly forms, what is commonly
called the white of the eye; for though the
conjunctiva has been supposed to produce this
colour, and from thence probably received one
of its names, albuginea, yet in reality the con-
junctiva, though whitish, does not afford much
colour of itself, but being transparent, the co-
lour of these subjacent parts is seen strongly
through it.

The temporal and frontal arteries send
branches to the tunica conjunctiva, and these
branches communicate with those which are
sent to the integuments of the eye-lids, and to
the orbicular muscle. The same membrane
is likewise supplied with blood-vessels, by
means of the internal maxillary artery, which
sends a considerable branch into the socket,
where it divides, and spreading into various
ramifications, is distributed to several parts of
the eye, and amongst others, to the tunica con-
junctiva. The vessels of that portion of this
membrane, which have been distinguished by
the name of conjunctiva of the eye, are
chiefly such as in their natural state carry on-
ly lymph or serum, and are not visible unless
made so by anatomical injections; or else,

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when in the living subject, they are accidentally distended with blood in inflammations of the eye; or when the blood is admitted into and stagnates in them, by a mere weakness or relaxation of these vessels.

The admission of blood into these vessels, is a circumstance which frequently deserves attention in disorders of the eyes. The eyes we know are subject to inflammations from a variety of causes, in most of which, not only the sanguinary vessels of the conjunctiva are fuller and more distended than is common, but the blood, as was before intimated, is likewise thrown into the numerous lymphatic vessels, and occasions chiefly that general appearance of redness which attends these disorders. The method of treating these inflammations in their first state, is sufficiently obvious; but there is a time in many of these cases, (to be judged of by the general indications, and by the means of cure that have been already made use of,) when the redness and fullness of the vessels will in a great degree remain, and yet to pursue the same method of cure as was at first directed, would be very improper. The truth is, the fine lymphatic vessels

THE TUNICA CONJUNCTIVA. 35
vessels, which either from fullness, heat, or
other general cause in the constitution, have
had the blood thrown into them, will for
considerable time admit the same after the
original cause of the disorder is removed :
They are now so relaxed and weakened by
the distention which they have suffered, that
they still admit the blood, for want of
power to contract themselves to their natural
diameter, and thereby to resist the influx of it
into them.

Upon this occasion it may not be improper
to take notice of those external applications,
which are known by the names of eye waters,
animsents, or ointments for the eyes.

Among the variety of medicines which are
distinguished, as being *good* for particular com-
plaints, there are few that have been more
celebrated, than certain compositions for the
disorders affecting the eyes and eye-lids. Most
of these are recommended indiscriminately for
almost every complaint of these parts ; in
which kind of practice it is not to be supposed,
that any just idea of the medicine directs the use
of it. On the other hand, the real properties
of these medicines are not, I conceive, suffi-

ciently explained, where a more intelligent method might have been expected. Most writers upon the distempers of the eyes, recommend applications of this sort, but they either speak of them in too general terms, without attempting to shew wherein their proper use consists, or they give a partial and undeserved preference to some particular composition. In fact, these medicines are almost all capable of doing service, under certain circumstances of the distemper; but as the advantages arising from a promiscuous use of them, must be owing rather to accident than judgment, the manner in which they may be supposed to act ought to be attended to. If we examine into the ingredients of these compositions, we shall find the basis of them is more or less of a restraining nature, and it is from this property that they are capable of doing service by contracting and thereby strengthening the vessels, which have been too much distended. In some cases a different form of these medicines may agree better than others; a liniment may be preferable to a water, or a water to a liniment, according to the nature or quantity of the discharge, with other

circum-

circumstances: besides that there is a peculiarity in some constitutions, which will not admit of the same means of cure, either external or internal, as are effectual in other people, and this is particularly true in the present case, in regard to unctuous applications—So likewise the strength of the medicine, with respect to its degree of restringency, is to be observed; and what is still of great consequence, the preparing or compounding these medicines ought to be done with the utmost exactness and neatness, that no rough particles may come in contact with the eye, which may create any unnecessary irritation there. These precautions being attended to, the applications just mentioned may be often employed with the greatest advantage; and when the principle upon which they are directed is properly considered, it is easy to see that many forms or compositions of these medicines will equally answer the purpose, without attributing any specific property to them.

The nerves of the tunica conjunctiva proceed from the opthalmic branch of the fifth pair.

In regard to the uses of the tunica conjunctiva,

it serves

as a ligament to connect the eye to the edge of the socket, and, being of a texture admitting some extension, it allows, notwithstanding this connection, of a free movement of the eye in different directions without pain or inconvenience. Also by the adhesion of this membrane all round to the edge of the socket, any foulness collected on the eye, or any irritating substance accidentally lodging upon it, are prevented from passing to the back part of the globe; an accident which might produce extreme pain, and could not without great difficulty be relieved. This membrane likewise gives a smoothness to the parts which it covers, and thereby makes the friction less considerable between the eye and the eye-lids.

Previous to the description of the other coats of the eye, it may be necessary to give some account of the optic nerves.

OF THE OPTIC NERVES.

THE optic nerves are two thick, round, and whitish bodies or chords, which arise pretty near each other, from two considerable eminences in the brain, termed thalami

halami nervorum optitorum. From thence they pass in an incurvated course outwards and forwards, but approach each other afterwards, and seem to unite before that part of the brain called infundibulum. After this seeming union of the optic nerves, they divide, and are sent separately through their proper orifices in the sockets, to the posterior part of the eye-balls, where their coats and nervous substance are supposed to be expanded and continued on, as will be more particularly expressed hereafter, to form the different coats of the eye.

The insertion of the nerve is not directly opposite to the center of the pupil, but a little on the inside towards the nose; the reason of which will be explained in the description of the retina.

The substance of the optic nerves consists of medullary fibres, which are productions of the medullary substance of the brain. They are covered only with the pia mater, till they reach the orifices through which they pass into the socket: there the dura mater gives them another covering, which is continued on with the first.

Different opinions have arisen about the

seeming union of these two nerves before the infundibulum. Some think that they cross one another here; others, that their substance is mixed and blended together; and others imagine that there is only a strict cohesion of the two nerves, without any mixture of their substance, an opinion which seems to have been warranted by observations related by writers.

To return now to the description of the remaining coats.

OF THE SCLEROTICA AND CORNEA.

THE sclerotica and cornea are mentioned by some anatomical writers as two different coats of the eye, though they are now generally allowed to be only two different names to signify different parts of the same coat; the sclerotica being the external coat of the posterior part of the eye; the cornea, the external coat of the anterior part: others distinguish these two portions of this membrane, into cornea opaca and cornea lucida; by the first, understanding the posterior portion; by the latter, the anterior.

Till of late, it was the general opinion of anatomists, that the three different principal coats of the eye, were continuations and expansions of the different substances of the optic nerve; that is, the sclerotica was thought to be a production or continuation of the dura mater covering which this nerve receives from the dura mater; the choroides was supposed to proceed from the second coat of the optic nerve, arising from the pia mater; and the retina was said to be an expansion of the medullary substance of this nerve. These continuations or expansions are not now generally allowed, as they cannot be sufficiently perfectly ascertained by laying open and examining the course of the optic nerve: on the contrary, by examining this nerve, and comparing the structure of it with the sclerotica, the choroides, and the retina, there appears to be a considerable difference between the texture and thickness of these membranes and the texture and thickness of the parts whence they are supposed to be derived and continued. But though the force of this objection may have some effect against the common theory, yet, as other reasons are brought

brought to invalidate this objection, and as the origin of these coverings to the humours the eye is not otherwise well accounted for, may be proper to retain the old opinion till more certain one is established.

The sclerotica then, or the external coat of the posterior part of the eye, may be said to be a production of the dura-matral coat of the optic nerve. In man it is inelastic. This disposition in the sclerotica appears to be particularly useful ; for as it is necessary to alter occasionally the convexity of the cornea, in order to adapt the eye to the different distance and magnitude of the object to be seen ; and as in one instance which will be mentioned hereafter with the muscles, this alteration is supposed to be effected by drawing the eye backward into the socket, and pressing against the fat contained there, by which means the humours of the eye being protruded forwards, the cornea, which is elastic, is rendered more or less convex ; if the sclerotica had been as capable of being distended as the cornea is by its elasticity, this pressure would have been lost : the convexity of the cornea would consequently have remained unaltered, as it

parts of the eye would have given way in every part alike. The sclerotica is made up of several laminae closely connected, whose fibres run in different directions, and form a dense, compact substance. It is opaque, and also of considerable thickness, particularly in the posterior part where the optic nerve enters; but it gradually grows thinner towards the anterior part: here we see a change of appearance, and the external coat of the anterior part of the eye, from a fancied resemblance to transparent horn, takes the name of cornea.

The cornea consists of two principal laminae, an external and an internal, each of which is composed of thinner laminae. The substance of the cornea is, as was before observed, in some degree elastic, that, in order to fit the eye to the different magnitudes and distances of objects, its convexity might be rendered greater or less, as the humours of the eye are more or less protruded: it is likewise perforated with a great number of exceeding small orifices, thro' which a very fine fluid is supposed to be constantly discharged, but which soon evaporates.

The

The sclerotica and cornea are furnished with arteries chiefly from a branch of the internal carotid, which entering the socket with the optic nerve, gives, amongst other ramifications, several which run into the posterior portion of the sclerotica : of these, some are distributed into the different parts of this membrane, whilst others after running a little way obliquely in the substance of it, penetrate through it, and pass on to the next coat, the choroides.

The nerves proceed chiefly from the optic thalamic branch of the fifth pair, which running into the substance of this membrane, some, like the blood-vessels, are sent into the different parts of it ; whilst others, after passing a little way in the substance of the sclerotica, penetrate through it, and are continued on between the sclerotica and choroides towards the iris, having the appearance of fine ligaments.

The sclerotica and cornea serve in general to enclose and cover the humours of the eye ; the cornea, in particular, serves to transmit the rays of light into the eye, and produce the refraction of those rays necessary to vision.

The natural transparency of the cornea, so necessary for the admission of light into the eye, is liable to be altered and obscured by inflammations or humours affecting the fore-part of the eye, the frequent consequences of which, where they remain any time, are a thickening of particular parts of the cornea, posthumations in this membrane, or ulcerations: these are apt to leave opaque marks or spots in the cornea, which according to their size or situation, intercept more or less the passage of light, and are with much difficulty, if at all removed, especially in grown people. A very large number of those unhappy persons, who, from a defect or total loss of sight, are uncomfortably to themselves, and burthened to their friends or the community, owe their misfortune in this respect, to the want of early application for assistance, or to that assistance being administered less speedily than the nature of such cases generally requires, to prevent the spots or marks before-mentioned. It cannot therefore be too often and too early inculcated, that every suitable method of relief should be employed here with the most expedition.

T H E

THE CHOROIDES.

AMONG the variety of instances in anatomy, where the subject is perplexed by different distinctions, this membrane is one. From its resemblance to the chorion, in respect to its numerous blood-vessels, it appears originally to have had the name of choroides. From some fancied similitude to a grape in regard to its form and colour, the whole or part of this membrane had likewise the name of uvea given to it. Among the moderns, some divide it into two parts, calling the posterior portion, choroides, the anterior uvea, and the external surface of the latter, on account of the variety of its colour, iris. Others call the whole anterior portion iris, reserving the name of choroides to signify as usual the posterior portion of the membrane; and this last distinction will be observed in the present account.

The choroides is situated within the sclerotica, lying contiguous to the inner surface of it, and derives its origin, according to the more generally received opinion, from the second pia-matral covering of the optic nerve. When the sclerotica is removed, the choroides appears

ars of a dark-brown or blackish colour. The choroides is divided into two laminæ, the external of which is slightly connected to the sclerotica, and is covered with a black substance interposed between it and the sclerotica. Both laminæ are extremely vascular, but the internal is furnished with a great number of inosculated blood-vessels, whose almost innumerable ramifications project from its inner surface, and have been termed by some writers villi and papillæ; and this lamina being first distinguished by Ruysch, has the name of tunica Ruyschiana. The same black substance which, as was just now observed, covers the external surface of the choroides, being interposed between that and the sclerotica, appears also on the internal surface of this membrane between it and the retina. Some reckon this black substance, which has been considered by writers as a pigment, to be an exceeding fine membrane analogous in texture, to what is termed in anatomy the tunica mucosum: it easily separates, and, when the choroides is put into water, dissolves into a kind of black paint. This black substance seems to answer different purposes: thus in the choroides, properly so called, it absorbs the rays of

of light, and prevents the reflection of them again into the eye; on the back of the iris and between the ciliary processes, it prevents the passage of the rays through them, it being necessary to distinct vision that no rays should pass to the retina, but such as, entering at the pupil, pass through the crystalline humour.

Near where the sclerotica and cornea join the choroides is connected and adheres strong all round to the sclerotica. At this circle of adhesion the choroides seems to change its colour and texture, appearing as a whitish kind of ring of a compact substance, which serves to form this connection between the sclerotica and choroides, and is termed *ligamentum ciliare*. Here the internal lamina of the choroides dips inwards to make what are termed the *processus ciliares*, a name which is given to these processes, from their supposed resemblance to the cilia or eye-lashes. The ciliary processes, which are very numerous and close to one another, appear as radiated folds or wrinkles of the internal lamina from the part before-mentioned, and the external extremity of each fold respects the circle of the *ligamentum ciliare*. From this point the processes

ciliary processes run upon the fore-part of the vitreous
 humour to the edge of the crystalline hu-
 mour in which they are inserted and termi-
 nate, like lines drawn from a circumference to
 center: the whole radiated ring made by the
 ciliary processes is sometimes distinguished by
 the name of *corona ciliaris*; and it may be
 proper likewise, in order to prevent confusion,
 to observe that many writers describe these pro-
 cesses by the term of ciliary ligament. After
 the black pigment, which lies thick in these
 ciliary folds, is washed off, numerous blood-
 vessels, that are continued from the cho-
 roides, appear plainly in an injected eye;
 and some of these enter into the crystalline
 humour. It is asserted likewise that between
 the duplicatures of the ciliary processes
 fleshy fibres may be seen lying in small grooves
 of the *membrana vitrea*; but modern enqui-
 ries do not confirm the existence of these fibres.
 Upon cutting the coats of the eye, and sepa-
 rating the crystalline and vitreous humours
 from their adhesions to the ciliary processes,
 part of the pigment before-mentioned is left
 lying in black radiated lines upon these hu-
 mours :

mours: these lines, of which further mention will be made, are called ductus nigri; and between them it is said the muscular fibres are situated.

In regard to the uses of the ciliary processes they serve, by being covered with the black pigment, to prevent any rays of light from falling on the retina, which have passed first through the crystalline humour. They likewise send vessels both to the capsule and body of the crystalline humour, and others probably to the vitreous humour. There is also reason to believe that by their numerous villi they contribute very considerably to the secretion of the aqueous humour. The opinion of their use has been more generally received, namely, that by their contraction the crystalline and vitreous humours are brought forward, making the cornea more prominent as when we would view small and near objects distinctly; but as the existence of muscular fibres in the ciliary processes is by no means proved, it may be reasonably doubted whether the actions of these processes have any power in the motion of those humours.

Having described thus the ciliary processes radiated folds or wrinkles, proceeding from that part of the internal lamina of the choroides which adheres to the ciliary ligament, it remains next to be observed, that the internal lamina of the choroides, after it has formed the ciliary ligament, leaves the sclerotic; and being continued in nearly a transverse direction, makes the anterior lamina of the perforated partition, which is seen through the cornea lying across the eye, and is called the iris: the internal lamina of the iris is formed by a continuation of the internal lamina of the choroides, after it is dipped inwards in the manner above described and made the ciliary processes.

The hole or opening in the iris called the pupil, is observed to have a different form, in different animals, according to the situation or form of the eye itself, and according to the peculiar occasions of the animal in its way of life. In man the pupil is round, the circle of which allows of being made greater or less upon different occasions by means of the iris, which has a power of

shutting out too much light or admitting a sufficient quantity, according to the nearness or distance of the object, or according to the degree of light required: these motions are called contraction and expansion. It has been dispute, whether these motions are the effect of muscular fibres or of a nervous tension and relaxation. Those who seem to have examined this affair carefully, agree in general, that there are between the laminæ of the iris, two orders of fibres, one circular or orbicular, anlying round the margin of the pupil or internal edge of the iris; the other radiated, or the extremity of which terminates at the circular order, the other at the external edge of the iris. It is indeed exceeding difficult to discover the fibres said to produce the motions of the iris; but as it is certain, that the iris is contracted and dilated, it is reasonable to suppose from the analogy of other parts, that muscular fibres subsist here and produce these actions.

The use of the pupil is to transmit the rays of light to the humours of the eye which are situated behind it: the use of the iris, as we have before intimated, is by its dilatation and contraction

action to determine the diameter of the pupil in any given quantity of light, so as to admit a sufficient number of rays for clear vision, and to exclude the rest.

The arteries, which in the description of the choroidica, were said to penetrate through the posterior portion of that membrane, pass afterwards through the external lamina of the choroides and are diffused through this membrane in numerous branches, some of which, from their direction, are called *vasa vorticosa*. From the branches of the external lamina are continued the fine vessels of the internal or the *membrana ruyfchiana*; and of these, some probably pass on to the vitreous humour as others do, by means at least of the ciliary processes, to the crystalline humour, contributing, it is to be believed, to the formation of those humours. From the vessels of the external lamina likewise are sent several ramifications to the circumference of the iris, where they produce a vascular circle called *circulus arteriosus*. From this vascular circle pass off many smaller vessels, some of which, after they have run about

two thirds of the breadth of the iris, inosculate and form the appearance of arches: from these arches are sent still finer vessels, terminating at the internal edge of the iris, and serving probably to secrete a part of the aqueous humour of the eye.

The veins of the choroides, and indeed of the other internal parts of the eye, empty their blood chiefly into the optic sinuses, to be conveyed to the internal jugulars: some of these veins however communicate with the external veins of the eye, and their blood is consequently carried to the external jugulars.

The nerves of the choroides proceed from the ganglion, formed by short ramifications of the opthalmic branch of the fifth pair of nerves and by a branch of the third pair. These run along the optic nerve, and perforating in white filaments the sclerotica, they pass afterwards between the sclerotica and choroides towards the iris; and then dividing again into several other very minute branches they terminate in the substance of the iris.

As an appendix to this article, it may not be improper to take notice here of the mem-
brana

ana pupillaris or velum pupillæ, an extream membrane, of which very little has been said by writers, and which has not been at all attended to till of late years. Both in the human and brute eye a very fine membrane is spread like a curtain before the pupil: This membrane, which was discoverable only in a fœtus, is termed the membrana pupillaris or velum pupillæ, and seems to be a continuation of the external lamina of the iris. The use of the membrana pupillaris is not satisfactorily determined: Some have supposed it serves to moderate the impression of the rays of light, and render them less troublesome to the tender organs of animals newly born; a plausible account at least, if not a true one. Agreeable to this, the supposition, that after birth the membrana pupillaris bursts or breaks, and contracting itself, approaches to the edge of the pupil; but what really becomes of this membrane after birth is still uncertain.

THE RETINA.

WITHIN the internal lamina of the choroides is a white soft membrane, which from its supposed resemblance to a net, is called retina, and is the third coat of the eye.

As the sclerotica was said to proceed from the external or dura-matral covering of the optic nerve, and the choroides to be an expansion of the second or pia-matral coat, so the retina is supposed to be a production of the medullary substance of this nerve, expanded like a membrane; though it must indeed be allowed, that by laying open the coats of the optic nerve, its medullary substance cannot be clearly traced, as continuing on to form the retina.

At the bottom of the eye, just where the optic nerve is inserted, the choroides is deficient, in order to admit the passage of that nerve: at the same place there appears a small white protuberance a little depressed in its middle; and at this depression pass out blood-vessels, which in general are expanded, through the substance of the retina. These vessels proceed

d from an artery that runs in the middle of optic nerve, and which, entering with t nerve into the globe of the eye, spreads erwards in the manner just mentioned: ne of the blood-vessels appear plainly in retina without the assistance of injections. e retina is connected to the choroides, and ends from the insertion of the optic nerve, r the surface of the vitreous humour, to the ernal edge of the ciliary processes; and e say it may be traced between the ciliary cesses to the circumference of the crystal- humour.

The retina is generally supposed to be immediate seat of vision; but this opi- n has been controverted, and the cho- es has been said to be the part which re- es the impression of the object. It should n however, by the impossibility of rays of t passing through the black pigment to the roides, that the retina is the part of the upon which visible objects are sensibly im- ed; and the rays of light striking upon membrane, the sensation is conveyed by optic nerves to the common sensorium in brain.

It

It is observed that the center of this expansion, or the part of the eye where the optic nerve is supposed to enter, either on account of some particular disposition of the nerve at that place or because the artery before-mentioned enters the eye there, is insensible. It appears therefore to be a wise contrivance of providence that the optic nerve should not enter the eye, in the point where the axis of vision falls, but is inserted on the internal side of the axis of vision by which means, though some of the rays from any point of an object may happen to fall on the insensible part of one eye, yet other rays from the same point will fall on the sensible part of the other eye; for it is proved by experiment, that one eye being shut, three objects may be so placed as one of them may be lost, though visible when both eyes are open. The reason of this is, the object whose rays fall on the insensible part of one eye, is discernible by other rays falling on the sensible part of the other eye.

T H E

H I R D L E C T U R E.

F T H E H U M O U R S O F T H E E Y E.

THE cavity of the eye is filled by pellucid substances called humours, which are three, the aqueous, the crystalline, and the vitreous.

THE AQUEOUS HUMOUR. All that space in the eye between the cornea and the anterior surface of the crystalline humour, is filled with a clear watery fluid, called therefore the aqueous humour. The space in which this humour is contained, is divided into two parts called chambers; that part between the cornea and the iris, and which is much the larger of the two, is called the anterior chamber; that part between the iris and the crystalline humour, which is very small, especially at the pupil where the crystalline comes almost into contact with the iris, is called the posterior chamber: these two chambers communicate

municate by means of the pupil. The vessels which immediately furnish this fluid are so extremely fine, as makes it difficult to speak of them with certainty. It is however probable that part of the aqueous humour is secreted from the blood, as was before observed by the very fine vessels sent from the vascular arches described in the account of the iris, and which terminate at the internal edge of the iris, and that a considerable portion of it is supplied by the fine arterial villi of the ciliary processes. These vessels, it is to be supposed by the smallness of their diameters exclude all particles of the animal fluids that are grosser than the most limpid water, at the same time that they suffer this fine fluid to pass into the eye. It is observable, that when a wound is made in the cornea, and the aqueous humour is discharged by this accident, it is renewed in a few days and sometimes sooner. From this observation, it is reasonable to suppose that the aqueous humour is perpetually secreted; and if it is thus constantly separated from the blood, there must necessarily be some means of carrying it off, since without this resource the cornea would be too much distended and protrude

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ded. The manner in which this superfluous humour is carried off is not clearly demonstrated; but it is probable that part of it is taken up by absorbent veins, and part of it may transpire through the cornea. It is said that the aqueous humour is not perfectly clear in newborn infants, in order that their tender eyes may not at first be too violently affected by the light: it is further observed that in old age the humour sometimes changes its consistence, becoming thicker; and likewise alters its colour, growing whitish; by which means the rays of light do not pass so freely to the retina as usual: and this among other more common causes may be one reason of imperfect sight in old people.

The use of the aqueous humour is to keep the cornea distended, and in such a state of convexity as to refract the rays of light in a proper degree; to preserve a due distance between the cornea and the crystalline humour; and to serve as a proper medium for the iris to act loosely in, whereby its different actions may be performed more easily. Some likewise suppose the aqueous humour is necessary
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for the crystalline to move in, that objects may be seen more distinctly at different distances.

THE CRYSTALLINE HUMOUR. Next to the aqueous is the crystalline humour, which is a transparent mass resembling crystal whence it takes its name. It is situated between the other two humours, its anterior part being opposite to and very near the pupil; its posterior portion being lodged in a cavity formed for its reception in the middle and fore-part of the vitreous humour. The figure of the crystalline is that of a lens, convex on both sides but rather more so posteriorly. This humour, which is the least of the three, is of a much more firm consistence, particularly in the middle of the lens than either the aqueous or vitreous; for this reason it has sometimes been called the crystalline body. In the center or more compact part, it feels like glue and may be easily pressed into different forms; but it gradually becomes of a less firm consistence, somewhat like a thick jelly, towards the outer surface. With time it is subject to change both its consistence and colour, growing still more firm, especially in the middle, and gradually taking a yellowish
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ge. The crystalline humour is membranous, and consists of a great number of coats inclosed in one another and connected mutually one to another by very fine fibres. The crystalline is contained in a capsula formed by a continuation of the coating of the vitreous humour hereafter to be described. This capsula, which is sometimes named *aranea*, is a fine transparent membrane, elastic, and rather thicker in its anterior than its posterior part. It is furnished with vessels from the ciliary processes, and from an artery which enters at the bottom of the capsula and runs through the vitreous humour, of which will be further taken notice of in the description of that humour. If the capsula be pricked with a needle, and a blow-pipe applied to the orifice, the air may be introduced between the capsula and the crystalline, and will form a small transparent bladder. It has been observed likewise, that after pricking the capsula in this manner, a little clear water will sometimes be discharged from the puncture; and it has been thought that the external portion of the crystalline body is of an aqueous nature, and that the middle and more solid part

part of it swims as it were in this water. It has been asserted, in consequence of this opinion, that the body of the crystalline humour has no connection or communication with the capsula, nor is nourished in the ordinary way by a circulation of fluids, but by absorption. This opinion, however, though it has been espoused by very eminent writers, does not appear to be sufficiently warranted; as there is good authority to believe that the vessels, which pass from the ciliary processes to the capsula, are continued from the capsula to the body of the crystalline. Admitting then such a continuation of vessels, which we must suppose to be extremely fine, it is reasonable to conclude that the capsula, being elastic, will if punctured be drawn back in consequence of that elasticity, and that the fine vessels just mentioned, being necessarily torn by this means, the body of the crystalline will be separated from its proper coat, and water will ooze out from these lacerated lymphatics. Perhaps too the quantity of the water may be increased by the eye being examined after it has been kept some time, which may have occasioned part of the crystalline

dissolve

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dissolve. The chief use of the capsula is to
confine the crystalline humour in its pro-
per situation, to which purpose the con-
nection between the capsula and the vitre-
ous humour, the manner of which will be
explained in the next article, is subservient.
To explain the uses of the crystalline itself, it
has been supposed by some that the ciliary
processes, which are partly inserted into the
circular rim or anterior portion of the vitreous
humour, will, when they contract, depress the
vitreous humour; that this depression of the
vitreous humour will push forwards the cavity
that receives the posterior part of the crys-
talline, and of course the body of the crys-
talline humour will be protruded nearer
to the cornea; but that when the ciliary pro-
cesses are relaxed, the vitreous humour will
return to its former situation, and the crystal-
line again recede nearer to the bottom of the
eye. By this means it is imagined that the
distance of the crystalline from the re-
tina is occasionally fitted to the different di-
stances of objects. The most acknowledged
use of the crystalline humour is to pro-
duce

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duce a second refraction of the rays of light, the first refraction, which is produced by the cornea and the aqueous humour, not being sufficient to bring them to a focus at the retina.

VITREOUS HUMOUR. The third and last of the humours of the eye is the vitreous, called so from its resemblance to melted glass. It occupies all the posterior, and indeed the greatest part of the globe of the eye: the consistence of it is thicker than the aqueous, but less firm than the crystalline; it is a very transparent mass, and has a good deal the appearance of a fine clear jelly; but if exposed some time to the air, it gradually collapses and wastes, a fine limpid water oozing through the membranes which give this humour its consistence, for the substance of this mass is composed of numerous little membranous cells or vesicles filled with a pellucid humour. It has already been hinted that the formation of this humour may be partly owing to a continuation of the vessels making the papillæ of the internal membrane of the choroides; but probably a considerable share of it is derived from
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The ramifications of a vessel, which proceeds
from the artery that has already been describ-
ed as running through the center of the op-
tic nerve. The ramifications of this artery
are indeed in general distributed on the retina ;
but there is one branch arising from it which
passes quite through the vitreous humour, and
ends itself in a beautiful manner on the back
of the capsula of the crystalline. This vessel
gives off very fine lateral branches as it passes
through the vitreous humour, and from these
it is reasonable to suppose the pellucid humour
above-mentioned, may be in a great mea-
sure secreted. In the middle and fore-part
of this humour is a depression or cavity, which
gives the posterior portion of the crystalline,
at the margin of this cavity appears like
a circular protuberance. On this circular protu-
berance are seen the little radiated chan-
nels before-mentioned, which are made by the
ciliary processes as they pass to the circular
margin of the crystalline, and which appear
at their bottom upon separating the crys-
talline and vitreous humours from their adhe-
sion to the ciliary processes. This appearance

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of blackness is owing to the substance before described under the name of black pigment which covers the ciliary processes, and of which part is now left at the bottom of these channels after the processes are removed.

The vitreous humour is covered with a coat that is perfectly pellucid, and is termed the tunica vitrea. It is contiguous to the retina and is a double membrane. The internal lamina of this membrane is said to insinuate itself into the substance of the vitreous humour in order to form the little cells or vesicles before-mentioned; but this humour having no depression or cavity, as has been just described in which the posterior portion of the crystalline is lodged, the two laminæ of the tunica vitrea separate when they arrive at the edge of this cavity: here the internal of these two laminæ passes between the vitreous and crystalline humours, serving to line the cavity in which the crystalline lies, and to make the posterior part of its capsula; the other lamina passes over the crystalline, and becoming thicker and elastic makes the anterior part of the capsula.

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The use of the vitreous humour is to fill up the back part of the eye, and together with the crystalline and aqueous, to preserve the due distance between the cornea and the retina; joining also with the other humours, so to reflect the rays of light as they may converge to a point on the retina.

The different humours being described, it may not be improper here to add some remarks on the depression and extraction of the crystalline, when it is become opake and forms the disease called a cataract.

The dispute about the cataract, whether it be an opacity of the crystalline humour, or whether it be a film or membranous substance formed in the aqueous humour behind the iris does now no longer prevail. It is the general opinion at present that a cataract is an opacity of the crystalline. By what means was this dispute determined? by a method the most likely to destroy an erroneous theory and to establish a true one, by examining into the structure of the parts after death. From this examination it appeared, that the crystalline humour was become more or less opake, and

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on the other hand, the supposed film or membrane was not to be discovered. The seat and nature of the cataract being in this manner established, the means of cure were more plainly indicated: either the opacity of the crystalline humour was to be cleared by medicine, or the humour itself was to be removed from its situation by an operation. The first of these has not been found practicable: there are no medicines yet discovered, which either internally or externally used, have the power of restoring the opaque crystalline humour to its natural transparency, 'Twas necessary therefore, in order to have the light transmitted to the retina, that this opaque body should be removed from its natural situation by an operation. Two ways have been practised for this purpose; the one to depress the humour, the other to extract it intirely out of the eye. The method by depression has generally been by passing an instrument, the couching needle, through the coats of the eye, into the crystalline humour, and pushing the humour gently down towards the lower and posterior part of the eye. The needle being then carefully withdrawn

drawn, and the crystalline left in this new-situation, the rays of light are again transmitted through the vitreous humour to the retina; and the defect in the refraction of these rays, for want of the crystalline in its natural situation, is to be supplied by a proper optic glass.

Whether the crystalline humour is by this operation always separated and dislodged from its cavity in the fore-part of the vitreous humour, or whether in attempting to do this, the vitreous is not sometimes turned and moved along with the crystalline humour, (from the strong connection between them by means of the capsula of the crystalline) is not easy to be determined. This is certain from experience, that it is much less difficult to depress the humour than to keep it depressed. The crystalline humour left at the lower part of the eye may be considered there perhaps not improperly as a foreign body, and having [in this place] a particular cavity for its reception as it is in its natural situation on the fore-part of the vitreous humour, the common pressure upon different parts of the globe in the several motions of it, but particularly on its po-

sterior portion, by the contraction of the muscles when the eye is drawn inwards, would be very apt to protrude this foreign body again into the bed or cavity which nature originally prepared for it. So likewise the force of coughing, vomiting, or putting the head into some particular position, have been known to raise the cataract into view again; and if we allow that the vitreous humour may be turned or moved along with the crystalline, in the depression of the crystalline, 'tis equally probable that nature, ever solicitous to preserve the due order of her necessary functions, will by some such means as have been just now recited, replace this organ in its former situation.

Upon the whole, the frequent return of the opake crystalline into its natural position after it had been depressed, the troublesome symptoms which, though not often, yet sometimes ensued either from wounding the coats of the eye, lacerating the ciliary processes, or doing other injury to these delicate parts in the depression of the crystalline, made the success of the operation uncertain in general,
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and the effects in some instances disagreeable; so that any other method of operating which carried with it a reasonable prospect of answering the purpose well, had a claim to consideration. Another method was proposed, and at first sight seemed so reasonable and proper, that, like many other discoveries, 'twas rather surprising it should not be sooner brought into common use (for the general scheme of the operation appears to have been thought of before, and the operation had probably been practised by the remarkable, itinerant operator of our own country) than that it should now be received with approbation and eagerness. It had been observed, that in the operation by depression, the crystalline had sometimes been dislodged from its cavity in the vitreous and had come forward into the anterior chamber of the aqueous humour, and that upon such occasions an incision had been made in the cornea, and the crystalline successfully extracted. From this consideration, 'twas not unreasonable to try whether the opaque crystalline might not generally be extracted intirely out of the eye with
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safety and success, through a proper opening made for its passage in the cornea. An opening is made in the cornea in such a manner as to give room for the crystalline to pass through it; the crystalline either by the common motions of the eye or by a gentle pressure made upon the eye, is brought forward towards the anterior chamber of the aqueous humour; the capsula of the crystalline is divided in order to free the body of the crystalline from any attachments which might keep it back, and to prevent the vitreous humour from being drawn along and discharged with it; the crystalline is protruded and passes out through the opening made in the cornea. Thus the obstacle which hindered the transmission of light through the vitreous humour to the retina, is forever removed, and the want of a due refraction of the rays occasioned by the discharge of the crystalline is to be supplied afterwards, as in the operation by depression, by an optical glass of a suitable convexity.

What has been the success of this method? not equal to what was wished and reasonably expected. Whether in the operation

ation by extraction, the iris was sometimes wounded in passing the needle thro' the cornea or in dividing the capsula of the crystalline; whether it was over-distended or torn by the crystalline's passing through the pupil; whether in the expulsion of the crystalline the ciliary processes were lacerated, and an extravasation of blood ensued from a rupture of the fine vessels of these processes or of other parts of this delicate organ; or lastly, and what appears to me very probable, whether the quantity of air let into the eye by the large wound made in the cornea, injures the humours and the membranes that invest them, often happens in some other cases where membranous parts are exposed to the air, is difficult to determine. This is certain, that violent and painful inflammations are apt to follow the operation by extraction, and sometimes considerable imposthumations ensue: in consequence of these, adhesions have been formed; the figure of the pupil has been changed or the motion of it entirely lost; and sometimes the globe of the eye is wasted and been destroyed. Even the scar

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from the wound in the cornea, or the thickening of the cornea in consequence of the long-continued inflammation upon it, are apt sometimes to hinder the free admission of the light through it.

Upon these considerations the operation by depression, hitherto at least, seems preferable; and it may be further said, that the operation by extraction may be afterwards practised if the other method should prove ineffectual. In regard to the method by depression, as the symptoms attending it are seldom very bad, and are free from danger; as some cases admit of a reasonable hope of success; and even when success is wanting, as the patient is left much in the same state as before the operation was performed; where the circumstances of the case are such as are commonly judged proper for the operation, it ought certainly to be recommended.

The next and the last parts to be considered, are the muscles.

OF THE MUSCLES OF THE EYE.

THE eye, thus curiously constructed to admit the rays of light and to receive the impresson of external objects on the bottom of it; placed likewise in a situation the most favourable for commanding the view of objects; and lodged in a bony cavity serving to secure it against many accidental injuries; would with all these advantages, have been much circumscribed in its uses, if it had been fixed in the socket without the power of being occasionally moved in different directions, according to the position of the object to be viewed. In order therefore to answer the important purposes of vision most effectually, the eye-ball is made capable of various motions, and is furnished with a proper apparatus of muscles for the performance of those several motions. Each eye has six muscles; four of which are called right or straight muscles; and they receive likewise other denominations relative to their situation, functions, or some power which they are supposed to have in expressing particular affections

fections of the mind. Thus one is called rectus superior, attollens, or elevator, and superbus; another is termed rectus inferior, depressor, and humilis; a third has the names of rectus exterior, abducens, and indignatorius; a fourth is styled rectus interior, adducens, and bibitorius; all these strait muscles arise by short narrow tendons from the bottom of the socket near the hole which gives passage to the optic nerve: they soon become fleshy, and running over the posterior part of the globe of the eye, are inserted into the anterior parts of the sclerotica by thin broad tendons, which by their expansions unite with one another, and are continued on to form the white of the eye.

The musculus rectus superior, passing over the upper part of the globe of the eye, is inserted into the superior and anterior part of the sclerotica; the rectus inferior passes along the under part of the globe, and is inserted into the sclerotica opposite to the insertion of the preceding muscle; the rectus exterior runs on the side of the globe next the temple, and is inserted into the sclerotica on the same side; the rectus interior passes on the side of the globe next the nose, and is inserted into the
sclerotica

erotica on that side, and opposite the insertion of the former.

When these muscles act singly, they serve either to lift the eye-ball upwards, or turn it downwards, to move it outwards or turn it inwards, according to the respective action of each muscle. Thus the rectus superior raises the anterior portion of the globe of the eye upwards when we lift up our eyes; the rectus inferior brings it downwards, when we turn the eye in that direction: the rectus exterior serves to move the globe sideways towards the temple; and the rectus interior to turn it inwards towards the nose. When two neighbouring straight muscles act together, they give the eye some degree of obliquity in its motion, as when the rectus superior and the adductor move together; they turn the eye obliquely upwards and towards the great angle; and so of the others: these last motions have been supposed to be effected by the oblique muscles. When all these muscles act successively, they give the appearance of a rotatory or rolling motion to the eye. If the straight muscles act with equal force and at the same time, they are said to draw the ball in some degree towards the bottom of the

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the socket, and to keep it as it were fixed and directed right forward. It is thought likewise that by drawing the eye towards the bottom of the socket, the posterior part of the eye may be so compressed against the fat contained in the socket, as to shorten the distance between the retina and cornea : at the same time the humours of the eye are supposed to be protruded forwards, and to render the cornea more convex, by which means the eye, it is imagined, is fitted to see small or near objects distinctly.

Besides these four strait muscles there are two others, which from their direction, are called oblique. They are distinguished by the names of *obliquus major* or *superior*, and the *obliquus minor* or *inferior*. The first of these is likewise termed *trochlearis*, from the tendon of this muscle passing through a cartilaginous pulley that is situated in the orbit near the great or inner angle of the eye. The two oblique muscles together are by some named *circumagentes* and *amatorii*, from the power which they were supposed to have of winding or rolling about the eye in the manner of looking that is commonly termed *ogling*.

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The musculus obliquus major or superior is tendinous from the bottom of the socket, at the entrance of the optic nerve, and passing towards the upper part of the socket at the great angle of the eye, the round tendon of this muscle runs through a cartilaginous pulley, which is there fixed to a depression in the os frontis. From thence it is received and runs obliquely backwards inclosed in a ligamentous sheath, and is inserted tendinously into the sclerotica upon the upper part of the globe of the eye, a little more backward than the insertion of the rectus superior.

The musculus obliquus minor or inferior arises very fleshy, just within the edge of the lower and anterior part of the socket near the nose, and passing obliquely backwards under the globe is inserted into the sclerotica on the internal side of the eye.

When the first of these muscles, the obliquus major or superior, acts singly, it rolls the eye about its axis, drawing the globe forward and turning the pupil downwards; in the second, the obliquus minor or inferior,

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rior, acts singly, that too rolls the eye about its axis, serving likewise to draw the globe forwards; but turns the pupil upwards. When both the oblique muscles act together, they draw the eye outward from the socket; serving by this means as antagonists to counteract the power of the straight muscles, which when they all act together and with equal force, draw the eye-ball backwards; and even when they act singly, in the performance of their other motions, they have some tendency to draw the eye-ball backwards. The oblique muscles are thought likewise to have further use in bringing the eye-ball forward or outwards from the socket, as thereby they take off all pressure from the back part of the eye, and fit the form of the eye to view distant or large objects distinctly.

The muscles of the eye-ball are furnished with blood-vessels from the external carotid artery, by means of the internal maxillary artery: The branch of the internal maxillary which has been described to enter the socket and to be divided there into several ramifications, gives some to these muscles.

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The nerves which pass to these muscles are from the third, the fourth, and the sixth pair.

The third pair of nerves, or as they are likewise called, the motory pair or movers of the eyes, give a branch to the superior, to the inferior, and to the internal rect muscles; another branch to the inferior oblique muscle. The fourth pair, or as they are sometimes called, the pathetic pair, are spent on the superior oblique muscles; and the sixth pair of nerves are sent chiefly to the external rect muscle or abducens.

CONCLUSION.

HAVING endeavoured thus to give a plain account of the structure and uses of the eye and eye-lids, I have proceeded in this subject as far as the duty of my office requires. It might however have been no unpleasing task to have recapitulated and given in one collected view the various uses to which the several parts described are most admirably subservient; but as I may already have engaged more of your time than has been agreeable to your convenience or inclination, shall only beg leave to take notice in general terms——of the situation of the eye, as it is placed in that part of the body which is most advantageous for commanding the view of objects——of the figure of the eye, which with the contained humours, is best calculated to receive and refract the rays of light, as to form a distinct picture of external objects upon the bottom of it——of the manner in which the eye is connected to the socket, by which means it is properly retained there, and

it is capable occasionally of a free movement in different directions without pain or inconvenience——of the defence with which nature has furnished this organ against many external accidents, by inclosing the greatest part of it in a firm, bony cavity or case——of the adjustment of it upon a soft yielding bed of fat, which facilitates the motions necessary to vision, prevents the injuries of pressure from these motions, and keeps the parts in a degree of softness and flexibility——of the various movements which the eye is capable of, by means of its several muscles, according as the different situation of the object to be viewed requires——of the coats or coverings of the eye, and the substances called humours contained in those coats, for the production of the necessary refractions of the rays of light——of the power which the eye has by the expansion and contraction of the pupil to admit a sufficient quantity of light or exclude too much, according to the distance or nearness of the object to be viewed, or according to the degree of light it is seen in which is almost perpetually varying —— lastly of the number, the course

